

Daily report

16-11-2020

Analysis and prediction of COVID-19 for EU-EFTA-UK and other countries

Situation report 155

Contact: clara.prats@upc.edu

With the financial support of



and



Foreword

The present report aims to provide a comprehensive picture of the **pandemic situation of COVID-19** in the EU countries, and to be able to foresee the situation in the next coming days. We provide some figures and tables with several **indexes and indicators** as well as an **Analysis** section that discusses a specific topic related with the pandemic.

As for the predictions, we employ an **empirical model**, verified with the evolution of the number of confirmed cases in previous countries where the epidemic is close to conclude, including all provinces of China. The model does not pretend to interpret the causes of the evolution of the cases but to permit the **evaluation of the quality of control measures made in each state** and a **short-term prediction of trends**. Note, however, that the effects of the measures' control that start on a given day are not observed until approximately 7-14 days later.

We show an individual report with 8 graphs and a summary table with the main indicators for different countries and regions. We are adjusting the model to **countries and regions** with at least 4 days with more than 100 confirmed cases and a current load over 200 cases.

Martí Català
Pere-Joan Cardona, PhD
*Comparative Medicine and Bioimage Centre of
Catalonia; Institute for Health Science Research
Germans Trias i Pujol*

Clara Prats, PhD
Sergio Alonso, PhD
Enric Álvarez, PhD
Miquel Marchena, PhD
David Conesa
Daniel López, PhD
*Computational Biology and Complex Systems;
Universitat Politècnica de Catalunya – BarcelonaTech*

With the collaboration of: Daniel Molinuevo, Pablo Palacios, Tomás Urdiales, Aida Perramon, Inmaculada Villanueva

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Situation and highlights

Global situation

In this second wave, different countries have a common pattern in the evolution of the epidemics. **The value of the 14-day cumulative incidence A_{14} grows slowly and, at some point, a very large growth is triggered.**

We wonder out loud if it might reflect that a threshold has been exceeded above which satisfactory control cannot be performed. Once the threshold is exceeded, growth control is lost until social measures that limit the spread are taken.

This behavior can be explained with a very simple mathematical model. We can consider that the growth in the value of A_{14} (in the following expressions represented by N) is proportional to the number of undetected infectious people: $N - N_d$, where N_d are the people detected that we have ideally isolated. In this way, we can evaluate the growth of N from the equation:

$$\frac{\Delta N}{\Delta t} = a (N - N_d)$$

where a is a constant related with the reproduction number.

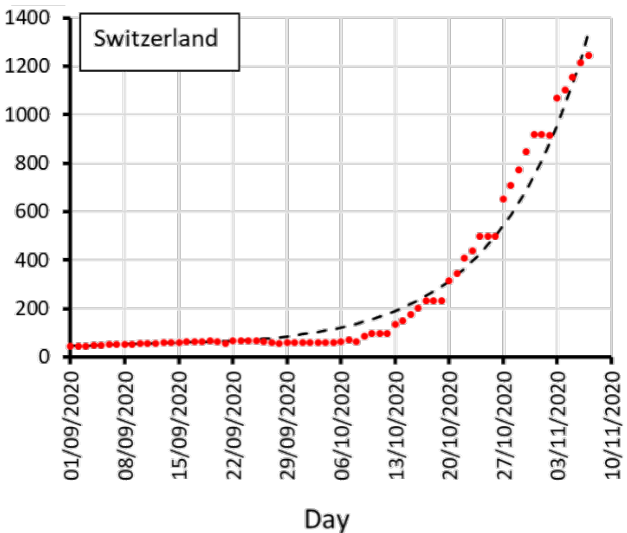
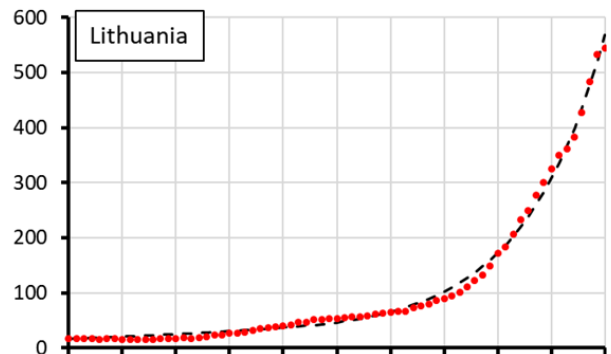
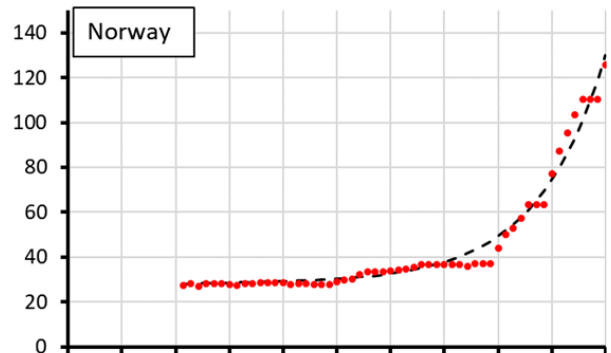
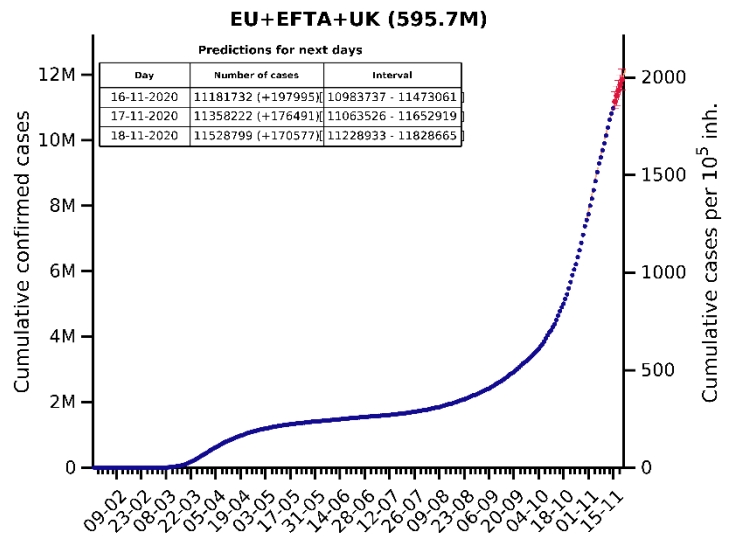
The observed behaviors can be reproduced if we consider that the number of people detected is proportional to N , but there is a maximum threshold value for N_d due to the system's capacity:

$$N_d = bN \quad \text{if } N_d < N_{th}$$

$$N_d = N_{th} \quad \text{if } N_d \geq N_{th}$$

This very simple model can fit the basic dynamics shown in the figures. The red dots are the experimental values and the dashed line is the fit obtained with the model. Careful analysis of the behavior of all countries is needed to assess the limits of such a simple model.

Whether this type of threshold models can be useful in the future or not, we think it is relevant to observe this apparent threshold. We observe, for example, that the value N_{th}



at the moment in these three examples has been between 30 and 45. These values seem to be smaller than most thresholds used as references in different countries to step up social distancing measures, normally around 50-100.

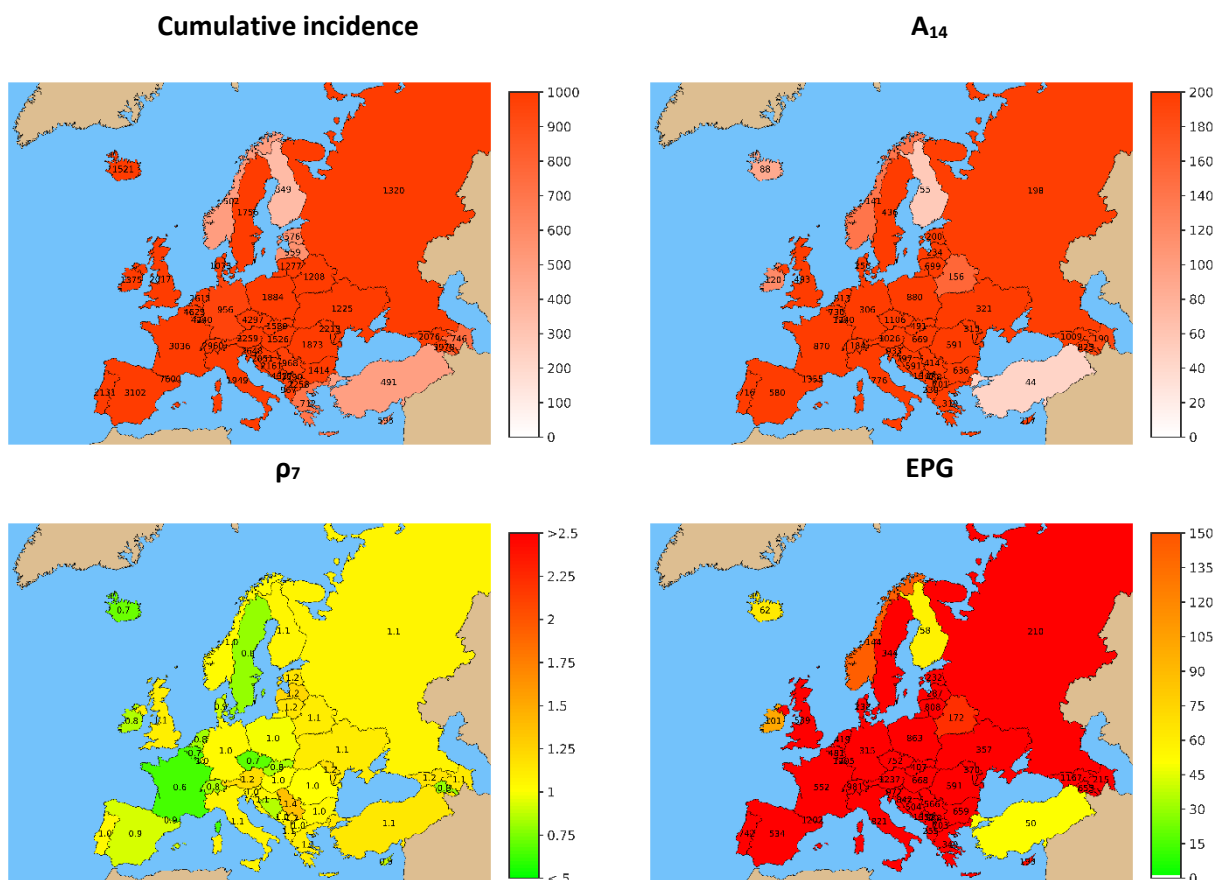
Highlights

- According to ICU occupation curves (see below), which are only available for a subset of countries, Belgium, France, Slovenia, Switzerland and Slovakia could be bending their ICU curves.
- The top-5 of countries with highest 14-day cumulative incidence has changed, once Czech Republic has clearly entered a decreasing phase. It is now led by Luxembourg (1,240 per 100,000 inh.), Switzerland (1,180), Lichtenstein (1,140), Czech Republic (1,110) and Austria (1,030).
- The list of countries with $\rho_7 > 1$ (i.e., with an increasing trend) has been drastically reduced last week. In fact, only Austria (1.2), Lithuania (1.1) Latvia (1.2) and Estonia (1.1) are still far from the $\rho_7 = 1$ threshold.
- Iceland has come back to the bottom of the incidence list, and it joins Finland at the low-risk zone ($EPG < 100$).

Situation and trends per country

Maps of current situation in EU countries. Colour scale is indicated in each legend.

- Cumulative incidence: total number of reported cases per 100,000 inhabitants
- A_{14} : Cumulative incidence last 14 days per 100,000 inhabitants (active cases)
- ρ_7 : Empiric reproduction number
- EPG: Effective Potential Growth ($EPG = A_{14} \cdot \rho_7$)



Tables of current situation in EU countries. Colour scale is indicated in each legend.

Incidence, mortality and epidemiological indexes.

Country	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	P ₇ ⁽¹⁾	EPG ⁽²⁾	Biocom-Cov degree
Luxembourg	1,240.0	7,762	4,240.4	26,544	35.5	222	0.97	1,205	9
Switzerland	1,183.9	102,458	2,960.1	256,186	34.2	2,956	0.83	981	9
Liechtenstein	1,138.0	434	2,582.8	985	10.5	4	0.90	1,022	9
Czech Republic	1,106.3	118,472	4,296.5	460,116	58.0	6,208	0.68	752	9
Austria	1,025.8	92,384	2,259.4	203,494	18.6	1,679	1.21	1,237	9
Slovenia	932.8	19,393	2,647.6	55,042	24.6	511	1.04	972	9
Poland	880.1	333,070	1,883.8	712,972	27.3	10,348	0.98	863	9
France	870.0	567,912	3,036.2	1,981,827	68.2	44,548	0.63	552	9
Croatia	796.8	32,711	2,051.2	84,206	25.6	1,049	1.06	842	9
Italy	776.0	469,194	1,949.2	1,178,529	74.8	45,229	1.06	821	9
Belgium	729.6	84,562	4,623.5	535,843	124.4	14,421	0.66	481	9
Portugal	715.5	72,960	2,131.1	217,301	33.2	3,381	1.04	742	9
Lithuania	699.4	19,039	1,276.8	34,758	10.2	277	1.16	808	9
Hungary	669.5	64,676	1,526.4	147,456	33.0	3,190	1.00	668	9
Bulgaria	635.9	44,182	1,414.0	98,251	30.7	2,130	1.04	659	9
Romania	590.6	113,618	1,872.8	360,281	46.4	8,926	1.00	591	9
Spain	580.3	272,913	3,101.7	1,458,591	86.7	40,769	0.92	534	9
Netherlands	513.0	87,898	2,610.7	447,335	49.5	8,475	0.82	419	9
United Kingdom	492.6	334,404	2,017.1	1,369,318	76.5	51,934	1.09	539	9
Slovakia	491.3	26,821	1,589.2	86,767	9.3	510	0.83	407	9
Sweden	436.0	44,028	1,756.1	177,355	61.0	6,164	0.79	344	9
Malta	392.9	1,735	1,793.0	7,917	21.5	95	0.97	381	9
Greece	319.3	33,276	711.9	74,205	10.6	1,106	1.09	349	9
Germany	305.9	256,300	956.4	801,327	15.0	12,547	1.03	315	9
Denmark	256.2	14,837	1,072.8	62,136	13.1	760	0.91	232	9
Latvia	233.9	4,411	559.2	10,547	6.5	123	1.23	287	9
Cyprus	216.6	2,615	594.5	7,178	3.3	40	0.89	193	9
Estonia	199.9	2,652	575.7	7,637	6.1	81	1.16	232	9
Norway	141.4	7,663	502.2	27,226	5.4	294	1.02	144	8
Ireland	119.5	5,901	1,375.2	67,903	40.1	1,979	0.85	101	7
Iceland	87.6	299	1,520.6	5,189	7.3	25	0.71	62	6
Finland	54.6	3,024	348.6	19,315	6.7	369	1.05	58	6

Colour scale							
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	0.0	0

Positivity indicators, comparing the increase among two last weeks (relative change).

Country	Cases (this week)			Tests (this week)			Positivity	
	Total	Incidence /10 ⁵ inh.	Relative change (%)	Total	Tests /10 ⁵ inh.	Relative change (%)	Value (%)	Relative change (%)
France	288331	430.3	-13.3	1456990	2174.2	-7.9	19.8	-5.9
Italy	223060	369.6	27.5	1406795	2330.7	7.1	15.9	19.1
Poland	158909	418.5	31.6	445691	1173.7	-3.0	35.7	35.7
Spain	143154	305.0	2.6	1104825	2353.8	-9.0	13.0	12.7
Germany	125575	151.3	21.0	1567083	1887.6	0.0	8.0	21.0
Romania	55660	286.7	56.6	210704	1085.3	3.0	26.4	52.0
Belgium	54953	479.7	-46.0	256495	2239.1	-38.3	21.4	-12.5
Netherlands	53150	307.5	-24.1	321719	1861.6	-20.4	16.5	-4.7
Austria	39918	450.6	48.9	199567	2252.8	18.8	20.0	25.3
Portugal	32261	313.9	28.2	242995	2364.5	9.8	13.3	16.7
Hungary	30417	311.2	52.5	128028	1310.1	19.6	23.8	27.5
Sweden	24624	240.7	39.2	228023	2228.9	20.5	10.8	15.5
Bulgaria	21641	309.2	41.6	71318	1018.8	14.4	30.3	23.8
Slovakia	16003	293.6	-5.1	86749	1591.6	-25.5	18.4	27.4
Greece	15558	145.1	68.0	148327	1383.1	17.8	10.5	42.6
Croatia	15388	377.5	0.2	57751	1416.8	2.4	26.6	-2.2
Slovenia	9964	478.8	-23.5	35105	1687.0	-13.4	28.4	-11.7
Lithuania	7895	282.6	50.5	69180	2475.9	9.3	11.4	37.7
Denmark	7879	135.7	13.5	461227	7943.9	6.0	1.7	7.1
Luxembourg	4548	740.8	7.8	67811	11046.0	-11.5	6.7	21.8
Norway	3662	68.7	57.1	165370	3103.7	21.1	2.2	29.8
Ireland	3399	69.3	-36.4	78398	1598.6	-11.1	4.3	-28.5
Latvia	1986	103.4	39.2	39222	2042.8	14.9	5.1	21.2
Cyprus	1505	171.8	63.2	26836	3063.8	18.6	5.6	37.6
Finland	1272	23.1	-12.9	87892	1592.8	-0.6	1.4	-12.4
Estonia	1028	77.6	85.6	15907	1200.7	34.2	6.5	38.3
Malta	997	202.0	49.5	24577	4979.5	8.9	4.1	37.2
Iceland	198	55.5	-58.0	9613	2692.8	-24.3	2.1	-44.5

Colour scale							
Worst	>150.0	>50%	Worst	0.0	-50%	>10%	>50%
Best	0.0	-50%	Best	>2000.0	>50%	0%	-50%

Table of current situation in some EU provinces. Colour scale is indicated in each legend.

Province	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Wien	832.4	15,790	2,559.9	48,561	24.9	472	1.49	1,240	9
Bern	798.6	8,266	2,232.9	23,110	25.3	262	0.79	629	9
Brussels	764.6	9,236	6,009.3	72,592	178.5	2,156	0.59	450	9
Lisbon	617.5	17,495	2,743.2	77,714	44.8	1,269	1.01	625	9
Lazio	603.9	35,501	1,433.5	84,274	28.0	1,646	1.05	635	9
North Holland	490.0	13,980	2,930.8	83,616	41.4	1,182	0.89	434	9
Berlin	410.3	15,466	1,265.5	47,697	9.6	363	0.99	406	9
Madrid	356.5	23,672	4,858.4	322,631	163.3	10,843	0.87	310	9
London	351.8	31,527	1,462.0	131,013	0.0	0	1.22	429	9

Colour scale							
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	0.0	0

⁽¹⁾ ρ_7 is the average of 7 consecutive ρ , but can still fluctuate. ⁽²⁾ EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10⁵ inhabitants by ρ_7 (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

Situation of hospitalisations and ICUs in some EU countries. The analysis is done for those countries that report a historical series with current (active) number of patients in hospitals and ICUs¹. We provide:

- Current active hospitalisations and patients in ICU per 100,000 inhabitants.
- Current absolute number of active hospitalisations and patients in ICU.
- Rate of occupation of curative care hospital beds by Covid-19 patients (data from Eurostat 2018²), only for hospitalisations.
- Current rate of occupation with regards to the maximum Covid-19 occupation reached in this pandemic.
- Weekly increase in Covid-19 patients in hospitals and ICUs.

Country	Hospitalisations					Intensive Care Units			
	Active /10 ⁵ inh.	Active (total)	Occupation (Eurostat 2018) (%)	Occupation (historical maximum) (%)	Week-to-week Growth (%)	Active /10 ⁵ inh.	Active (total)	Occupation (historical maximum) (%)	Week-to-week Growth (%)
Hungary	74.9	7236	17.3	100.0	19.7	6.0	582	100.0	28.3
Slovenia	60.8	1264	14.7	100.0	12.2	10.0	207	100.0	15.1
Italy	58.7	35469	22.7	100.0	23.8	5.7	3422	84.1	24.8
Belgium	56.2	6518	11.5	87.1	-4.9	12.4	1439	97.6	1.2
France	49.8	32499	16.0	99.4	13.6	7.5	4871	68.9	14.6
Switzerland	43.4	3752	12.2	93.3	2.9	5.1	442	90.0	5.5
Austria	39.7	3579	7.6	100.0	33.3	6.7	599	100.0	28.7
Slovakia	33.2	1815	6.9	97.0	3.3	1.8	100	82.6	-8.2
Portugal	28.7	2929	8.7	100.0	14.3	4.1	415	100.0	13.2

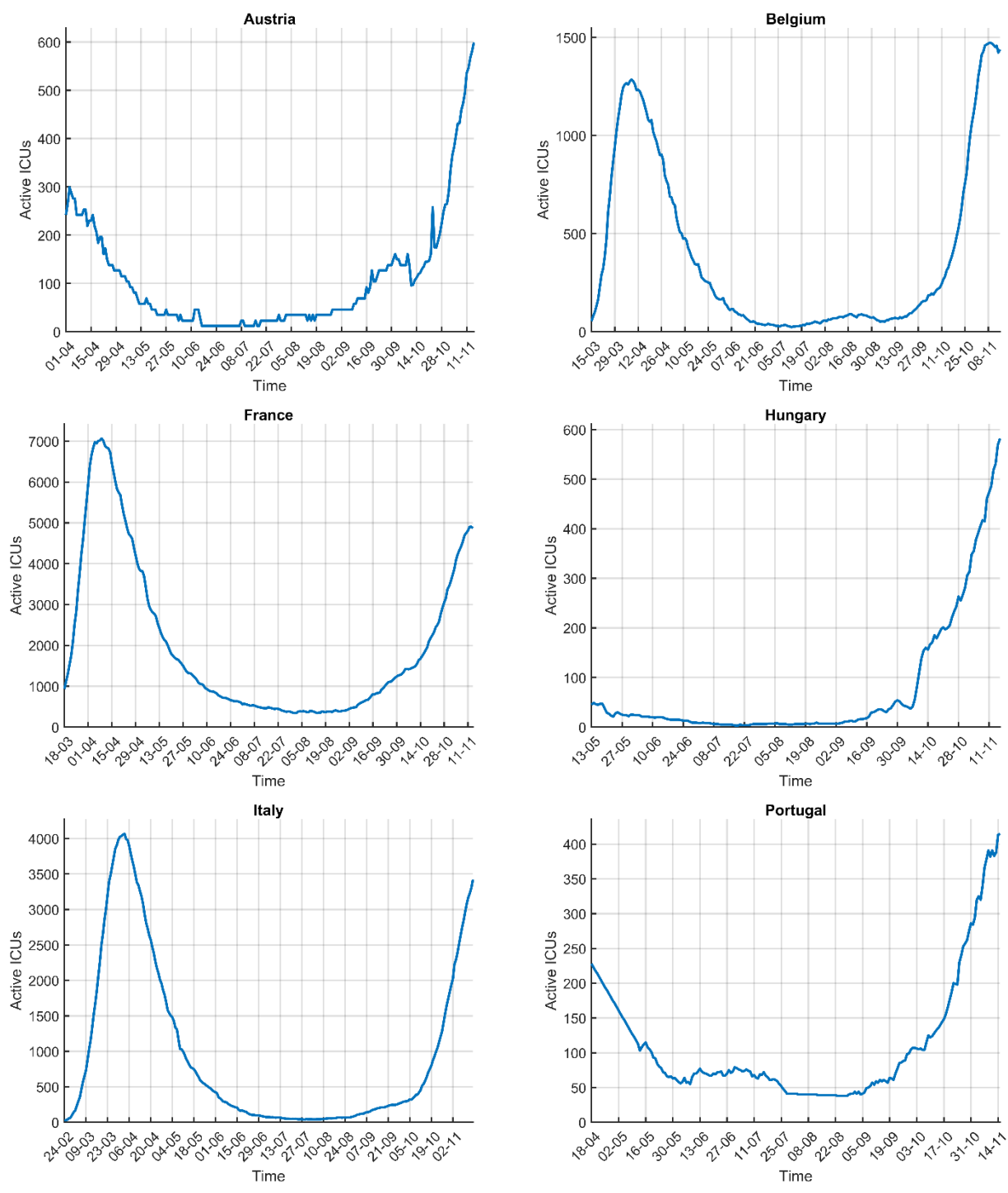
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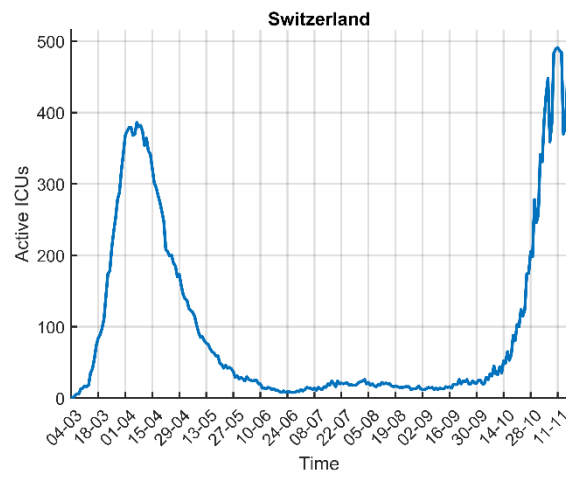
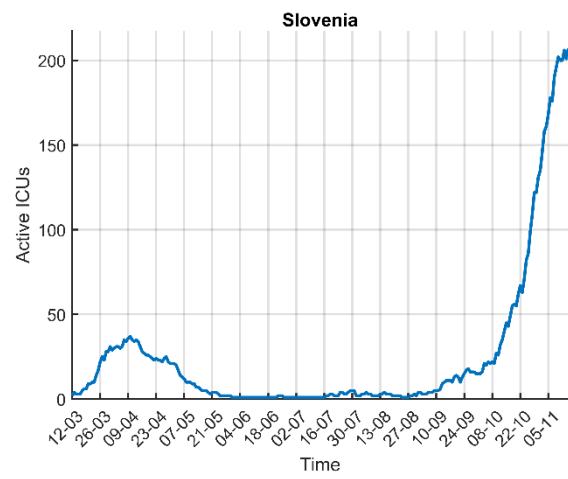
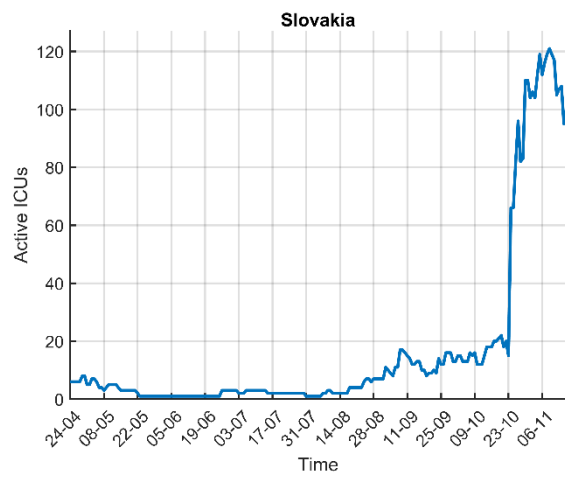
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¹ <https://github.com/ec-jrc/COVID-19>

² https://ec.europa.eu/eurostat/databrowser/view/hlth_rs_bds/default/table?lang=en

Evolution of of active ICUs in some EU countries.





Situation and trends in some European regions³

Table of current situation in the Netherlands by region. Colour scale is indicated in each legend.

Region	Reported data				Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
South Holland	619.8	22,989	3,545.8	131,515	0.85	524	9
North Brabant	585.1	14,891	2,817.8	71,713	0.82	478	9
Limburg	527.6	4,611	2,414.0	21,098	0.88	465	9
Overijssel	513.7	5,938	2,319.6	26,815	0.87	449	9
Flevoland	491.7	2,080	2,072.3	8,766	0.91	448	9
North Holland	490.0	13,980	2,930.8	83,616	0.89	434	9
Utrecht	485.7	6,348	2,943.8	38,475	0.94	456	9
Gelderland	426.6	8,839	2,144.3	44,429	0.87	369	9
Zeeland	368.9	1,413	1,347.0	5,159	0.89	329	9
Drenthe	246.7	1,214	1,344.7	6,616	0.86	213	9
Friesland	189.7	1,229	1,121.6	7,268	1.03	195	8
Groningen	175.3	1,022	1,240.3	7,231	0.94	165	8

Colour scale					
>150.0	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	0.0	0

Table of current situation in Switzerland by region. Colour scale is indicated in each legend.

Region	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Geneva	1,977.2	9,886	6,583.6	32,918	84.4	422	0.66	1,299	9
Vaud	1,635.4	13,067	5,276.7	42,161	59.2	473	0.76	1,237	9
Neuchâtel	1,533.3	2,714	4,661.6	8,251	77.4	137	0.65	995	9
Jura	1,467.1	1,071	4,509.6	3,292	71.2	52	0.63	927	9
Ticino	1,242.2	4,385	3,572.2	12,610	124.4	439	0.99	1,224	9
Valais	1,237.2	4,293	5,613.5	19,479	101.2	351	0.48	598	9
Solothurn	887.2	2,218	1,851.2	4,628	18.4	46	0.79	701	9
St. Gallen	801.5	4,152	2,518.3	13,045	33.0	171	0.79	636	9
Bern	798.6	8,266	2,232.9	23,110	25.3	262	0.79	629	9
Appenzell Innerrhoden	793.8	127	3,006.3	481	62.5	10	0.79	628	9
Obwalden	736.8	280	1,876.3	713	26.3	10	0.95	697	9
Basel City	713.0	1,319	2,184.9	4,042	30.8	57	1.35	960	9
Lucerne	698.0	2,750	2,057.1	8,105	14.5	57	0.85	591	9
Glarus	687.5	275	1,965.0	786	40.0	16	0.90	618	9
Zug	665.8	799	2,203.3	2,644	16.7	20	0.89	594	9
Aargau	638.3	4,328	1,865.9	12,651	17.8	121	0.80	508	9
Graubünden	635.4	1,258	1,950.5	3,862	37.4	74	0.79	503	9
Zürich	628.7	9,676	2,198.8	33,839	16.5	254	0.61	381	9
Appenzell Ausserrhoden	621.8	342	2,110.9	1,161	21.8	12	0.79	492	9
Schwyz	612.4	937	2,824.2	4,321	53.6	82	0.72	439	9
Thurgau	612.0	1,689	1,827.2	5,043	25.7	71	0.79	483	9
Uri	611.1	220	1,961.1	706	25.0	9	1.19	727	9
Nidwalden	586.0	252	1,790.7	770	18.6	8	0.64	374	9
Schaffhausen	583.8	432	1,621.6	1,200	23.0	17	0.90	525	9
Basel Country	570.8	1,604	1,671.5	4,697	18.1	51	1.10	628	9
Fribourg	313.7	7,102	797.0	18,045	11.9	269	0.68	213	9

Colour scale					
>150.0	Worst	Worst	Worst	Worst	>2.0
0.0	Best	Best	Best	Best	0

³ <https://github.com/ec-jrc/COVID-19/tree/master/data-by-region>

Table of current situation in Germany by region. Colour scale is indicated in each legend.

Region	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Sachsen	417.0	16,996	857.9	34,970	12.6	514	0.95	398	9
Berlin	410.3	15,466	1,265.5	47,697	9.6	363	0.99	406	9
Bremen	396.2	2,698	1,207.0	8,220	14.2	97	0.70	278	9
Bayern	396.1	51,805	1,214.4	158,849	24.0	3,144	0.94	370	9
Hessen	373.6	23,407	1,045.0	65,479	13.9	873	0.91	338	9
Nordrhein-Westfalen	372.0	66,701	1,131.2	202,817	14.7	2,637	0.87	324	9
Hamburg	340.5	6,467	1,064.8	20,220	16.5	313	0.91	309	9
Saarland	340.4	3,370	1,021.2	10,110	21.6	214	0.99	338	9
Baden-Württemberg	313.1	34,662	1,056.9	116,996	20.5	2,265	0.88	277	9
Rheinland-Pfalz	293.5	11,989	797.1	32,563	8.9	363	1.01	298	9
Niedersachsen	231.6	18,484	694.5	55,433	11.3	904	1.04	240	9
Brandenburg	189.9	4,785	510.8	12,873	9.6	241	0.94	179	8
Thüringen	178.3	3,811	513.9	10,982	11.9	254	1.03	184	8
Sachsen-Anhalt	133.9	2,957	369.6	8,161	4.8	105	0.90	121	8
Schleswig Holstein	111.7	3,229	398.7	11,522	7.7	222	0.88	98	7
Mecklenburg-Vorpommern	97.5	1,570	275.5	4,435	2.4	38	0.77	75	7

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

Situation and trends in other countries

Country	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
United States of America	552.8	1,829,699	3,334.4	11,037,061	74.4	246,214	1.27	699	9
United Kingdom	492.6	334,404	2,017.1	1,369,318	76.5	51,934	1.09	539	9
Ukraine	321.1	140,417	1,225.3	535,857	22.0	9,603	1.11	357	9
Argentina	303.0	136,956	2,899.6	1,310,476	78.4	35,436	1.00	304	9
Colombia	226.8	115,425	2,355.9	1,198,746	66.9	34,031	0.95	215	9
Russia	198.1	289,044	1,319.7	1,925,825	22.7	33,186	1.06	210	9
Iran	168.6	141,577	907.3	762,068	49.4	41,493	1.20	203	8
Canada	156.9	59,236	784.5	296,077	29.0	10,953	1.14	178	8
Belarus	155.8	14,726	1,208.4	114,185	11.1	1,046	1.11	172	8
Brazil	142.7	303,254	2,751.7	5,848,959	77.9	165,658	1.49	213	8
Iraq	109.1	43,864	1,290.7	519,152	29.0	11,670	0.91	99	7
Qatar	106.4	3,065	4,713.0	135,785	8.1	234	1.09	116	7
Israel	104.0	9,004	3,744.8	324,135	31.6	2,732	1.05	109	7
Chile	101.5	19,409	2,779.2	531,273	77.5	14,819	1.00	101	7
Peru	97.4	32,100	2,841.9	937,011	106.9	35,231	0.88	85	7
Ecuador	62.9	11,101	1,021.9	180,295	73.7	13,008	1.04	65	6
Mexico	59.8	77,130	780.7	1,006,522	76.4	98,542	1.03	62	6
India	45.5	615,814	653.7	8,845,127	9.6	130,070	0.94	43	6
Turkey	43.6	36,805	491.2	414,278	13.6	11,507	1.14	50	6
Philippines	22.6	24,725	372.2	407,838	7.1	7,832	0.94	21	4
Indonesia	19.9	54,329	170.8	467,113	5.6	15,211	1.14	23	4
Saudi Arabia	16.1	5,599	1,014.7	353,255	16.2	5,657	0.92	15	3
Pakistan	10.8	23,939	162.5	359,032	3.2	7,160	1.33	14	3

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

⁽¹⁾ ρ_7 is the average of 7 consecutive ρ , but can still fluctuate. ⁽²⁾ EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10⁵ inhabitants by ρ_7 (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

Analysis: On the weekend effect on confirmed cases. Part III: Rethinking short-term prediction methodology to account for this effect.

Last week, we discussed the problematics of oscillating patterns in daily new cases associated to the days of the week, which are amplified on weekends (weekend effect). We started our argument on the basis of the 7-day moving average:

$$n_7(t) = \frac{\sum_{i=t-3}^{t+3} n(t_i)}{7}$$

Then, we assumed the daily weight as the ratio between new cases in a certain day, $n(t)$, and the corresponding 7-day moving average value, $n_7(t)$:

$$w(t) = \frac{n(t)}{n_7(t)}$$

Given this variable, we defined the **regular daily pattern of under/over reporting** by averaging the particular weight at each day of the week for 5 consecutive weeks. For instance, given a 5-week dataset, we could assess the Monday's particular weight as follows:

$$w_{Monday} = \frac{1}{5} \sum_{i=1:5} w(t_i) ;$$

$t_i = \text{Mondays}$

We proposed the use of last 5 weeks, only, because the reporting pattern can change with time.

In last report, we proposed a methodology to correct the weekend effect on the calculation of the empiric reproduction number. Today, **we propose a methodology to improve short-term predictions**. Let us start recalling the daily new cases and the daily patterns of under/over reporting for Slovenia, Germany, Italy and EU+EFTA+UK, which will be used as examples (Figure 1).

Next, we explain different steps that can be followed in order to incorporate these patterns in short-term predictions.

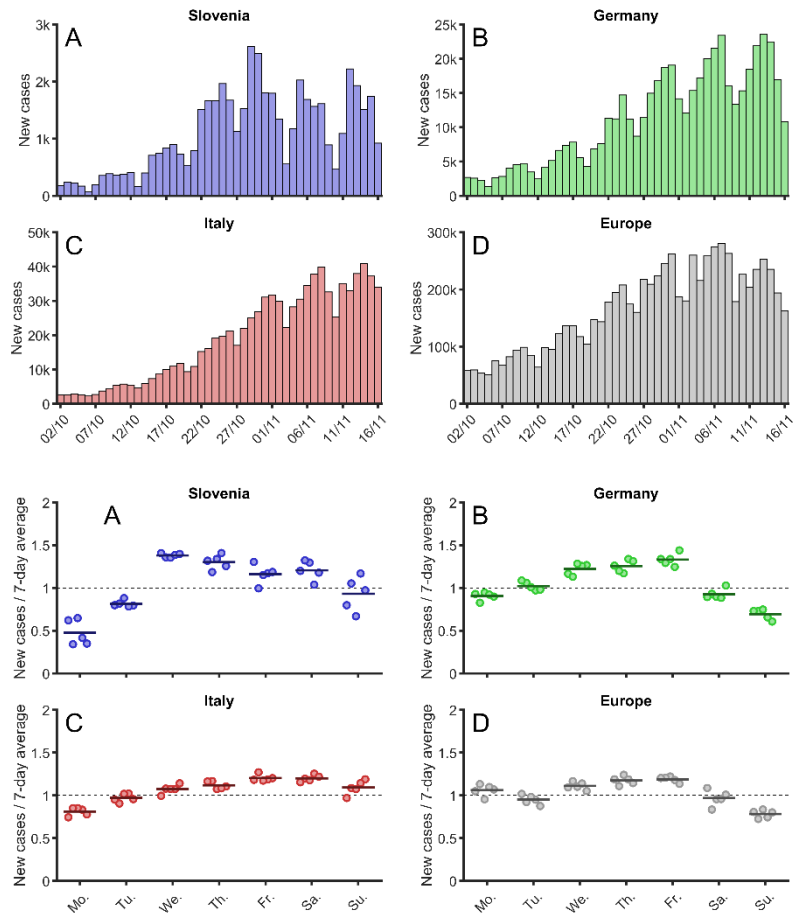


Figure 1. Up. Raw daily new cases in Slovenia, Germany, Italy and EU+EFTA+UK. **Down.** Reporting ratio between new cases in a certain day, $n(t)$, and the corresponding 7-day moving average value, $n_7(t)$, for each day of the week in Slovenia, Germany, Italy and EU+EFTA+UK. These ratios are evaluated for last 5 weeks

1) Re-normalization of new cases with the daily pattern of over/under reporting

First, we divide the daily new cases ($n(t)$) by the relative weight of its particular day of the week, $w_{week\ day}$.

$$\bar{n}(t) = \frac{n(t)}{w_{week\ day}}$$

The weights for the countries used as examples are those shown in Figure 1 (bottom). As a result, we obtain the re-normalized daily new cases shown in Figure 2.

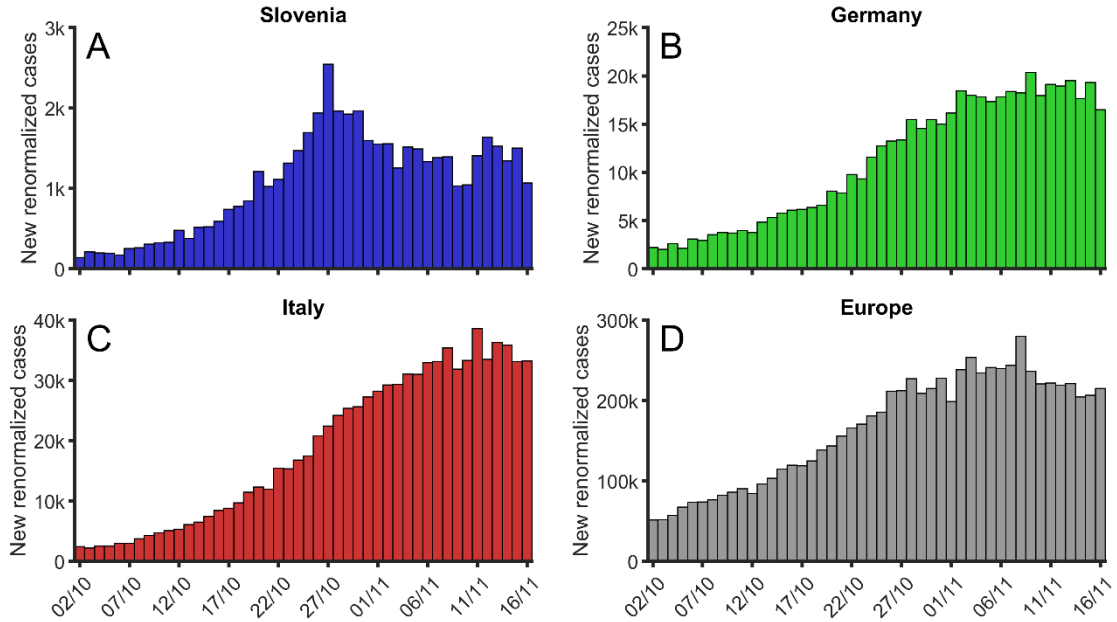


Figure 2. Re-normalized daily new cases of Slovenia, Germany, Italy and EU+EFTA+UK.

2) Obtaining re-normalized cumulative cases

Then, we can re-build the cumulative cases data series from the re-normalized daily new cases. As seen in Figure 3, the obtained curves are smooth.

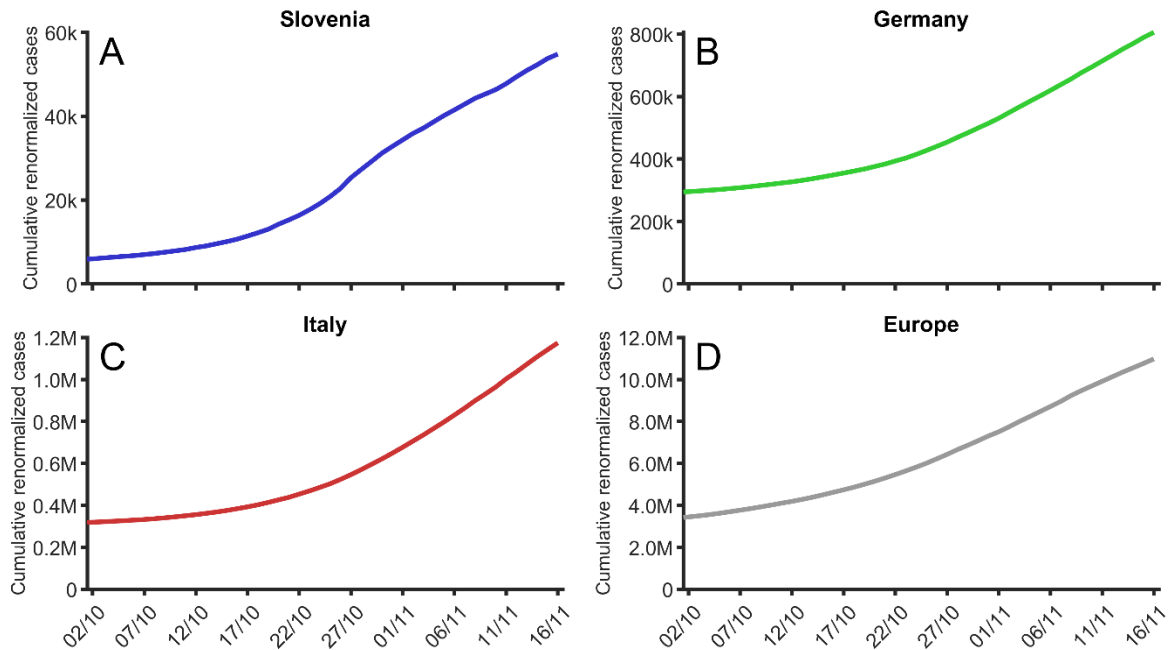


Figure 3. Cumulative re-normalized cases of Slovenia, Germany, Italy and EU+EFTA+UK.

3) Fitting the desired model to the re-normalized curves

Once the re-normalized cumulative cases curve has been built, the model that is being used for short-term predictions can be fitted to it. In our case, we work with the Gompertz model¹. This fitting allows for the prediction of expected cases for 1 to 2 weeks in the re-normalized framework, either cumulative or incident. We show those predictions for Slovenia, Germany, Italy and EU+EFTA+UK (Figures 4 and 5).

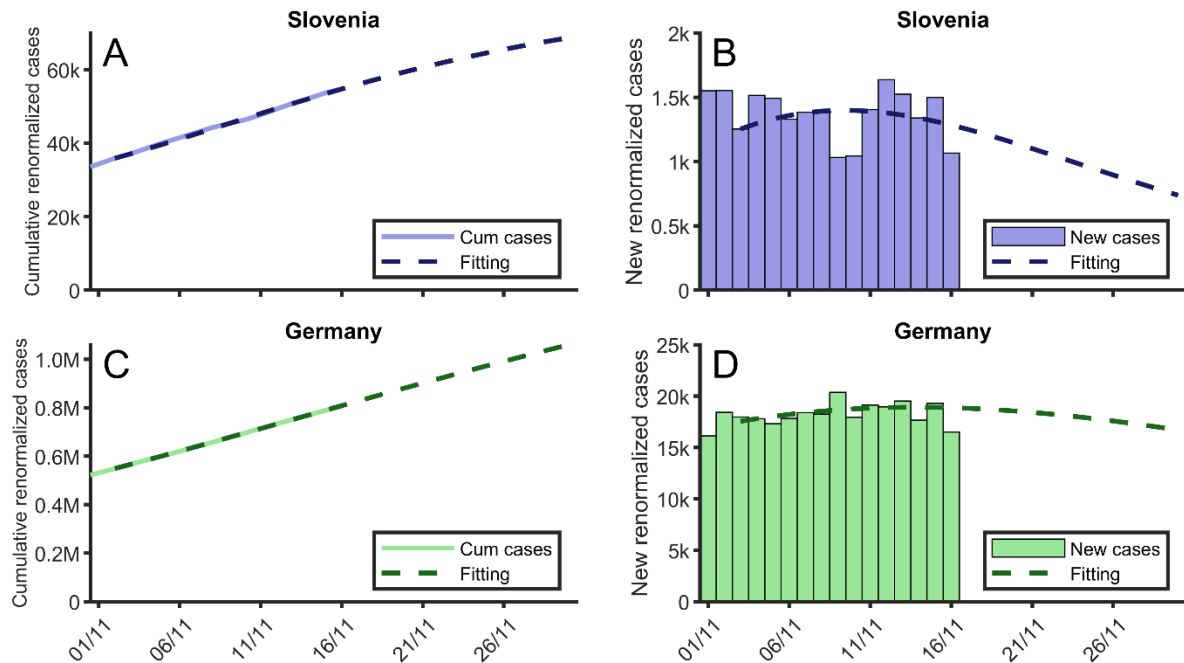


Figure 4. Predictions of expected cumulative cases (left) and daily new cases (right) in the re-normalized scale. Slovenia and Germany.

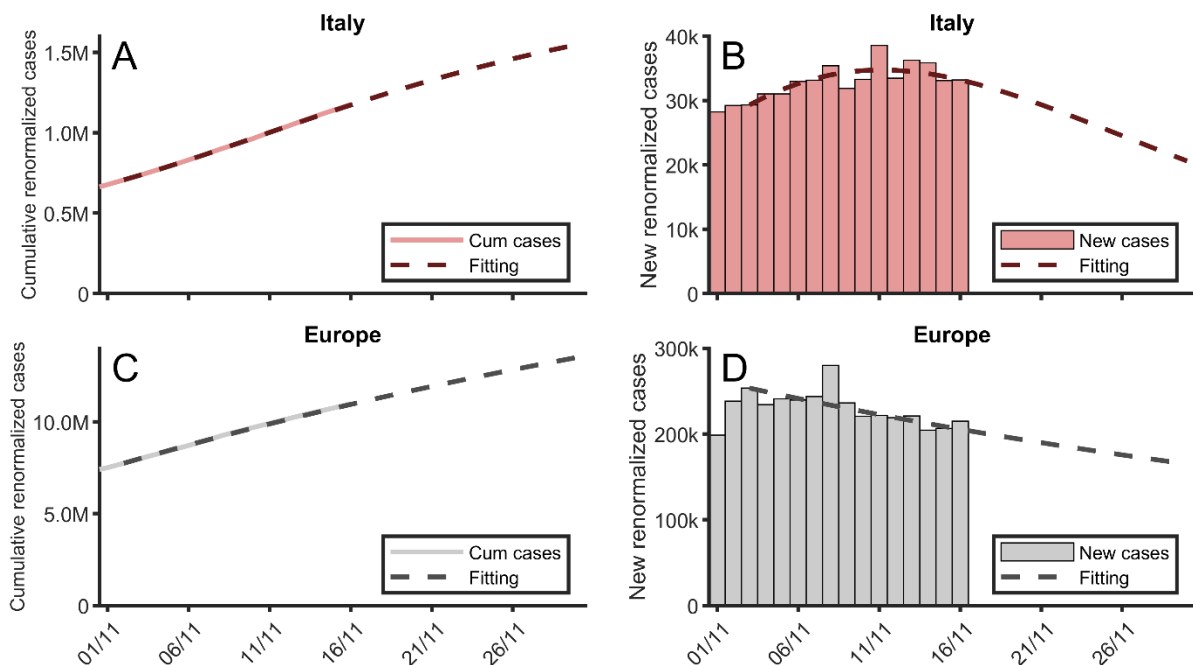


Figure 5. Predictions of expected cumulative cases (left) and daily new cases (right) in the re-normalized scale. Italy and EU+EFTA+UK.

¹ <https://www.medrxiv.org/content/10.1101/2020.05.13.20101329v1>

4) Transforming predictions from the re-normalized to real framework

Finally, we can undo the re-normalization by applying the opposite transformation to obtained predictions:

$$n_{predicted}(t) = \bar{n}_{predicted}(t) \cdot w_{week\ day}$$

This final conversion will allow for the comparison of predictions with daily raw data. In particular, the resulting predictions will show the same under/over reporting pattern of the historical series (Figures 6 and 7).

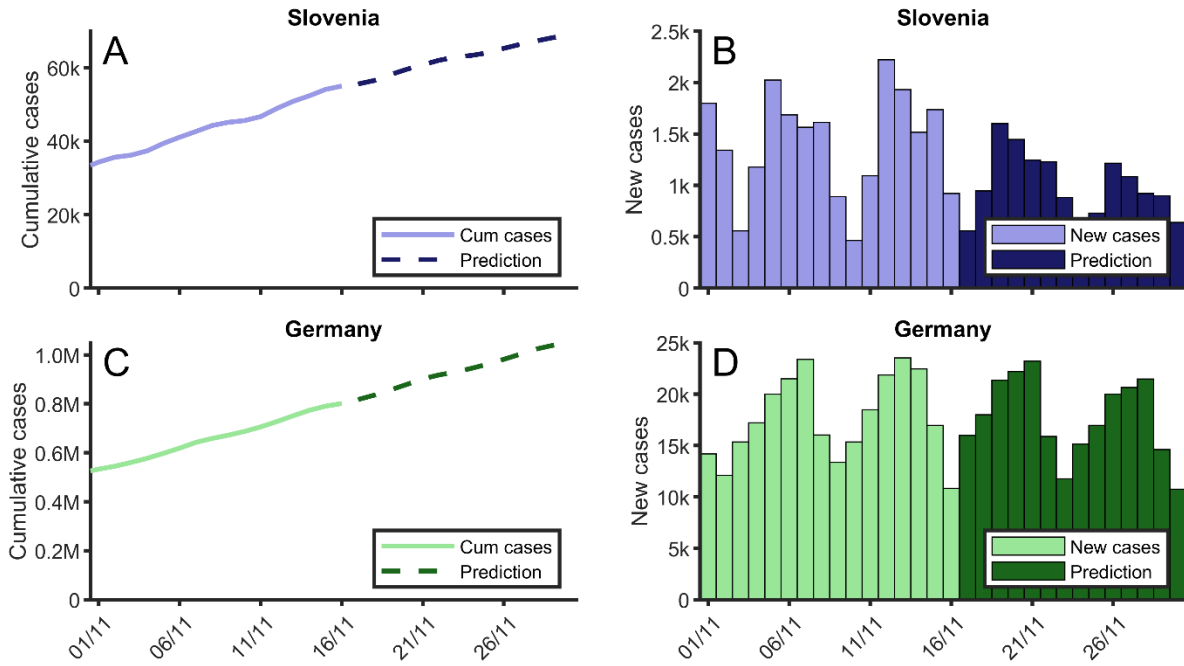


Figure 6. Predictions of expected cumulative cases (left) and daily new cases (right) in the real scale. Slovenia and Germany.

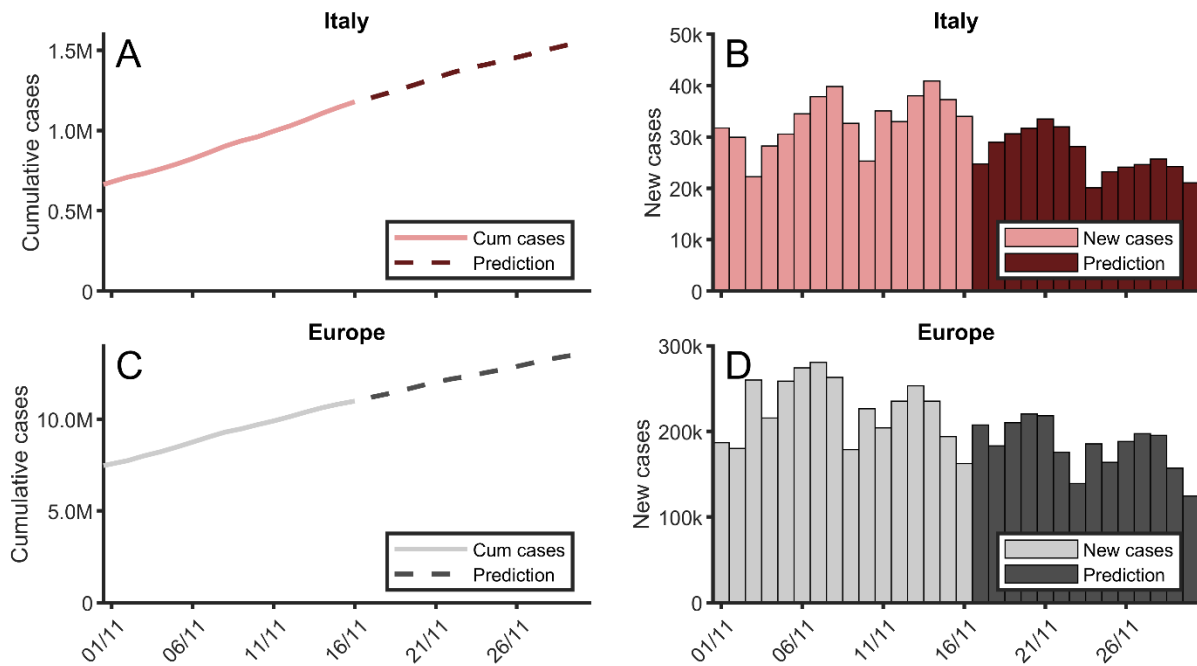
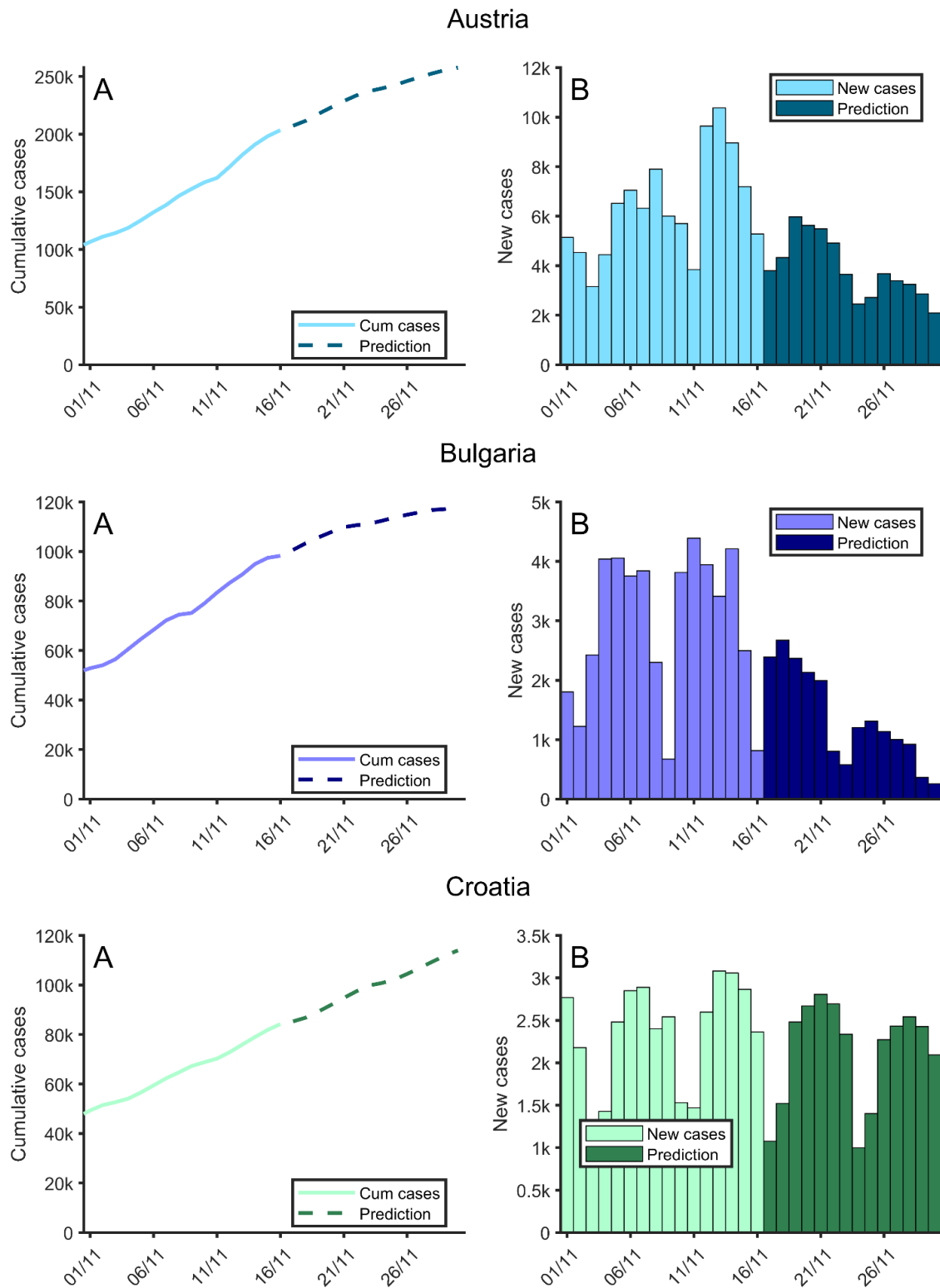


Figure 7. Predictions of expected cumulative cases (left) and daily new cases (right) in the real scale. Italy and EU+EFTA+UK.

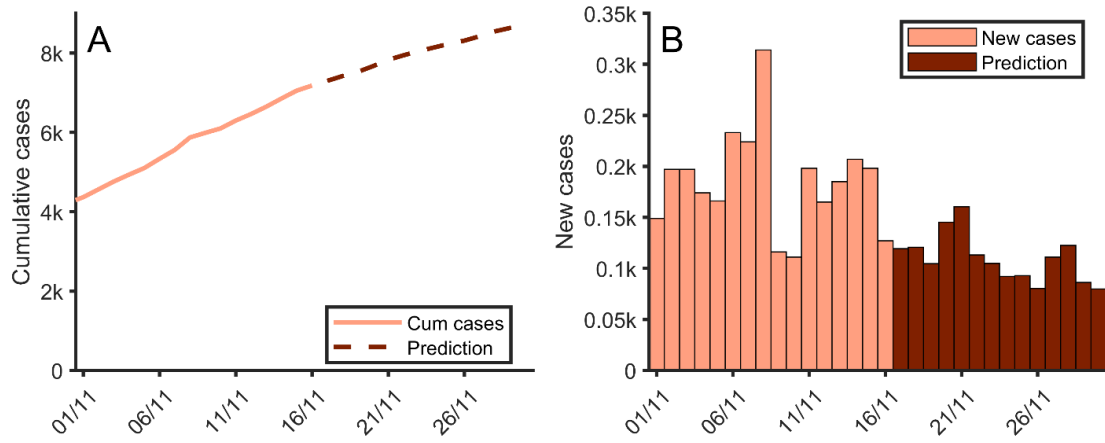
Conclusions

Short-term predictions may be numerically important for the daily management of the epidemic at a certain region or country. In this sense, accounting for the natural under/over reporting pattern is important to provide predictions that are as close as possible to the expected cases.

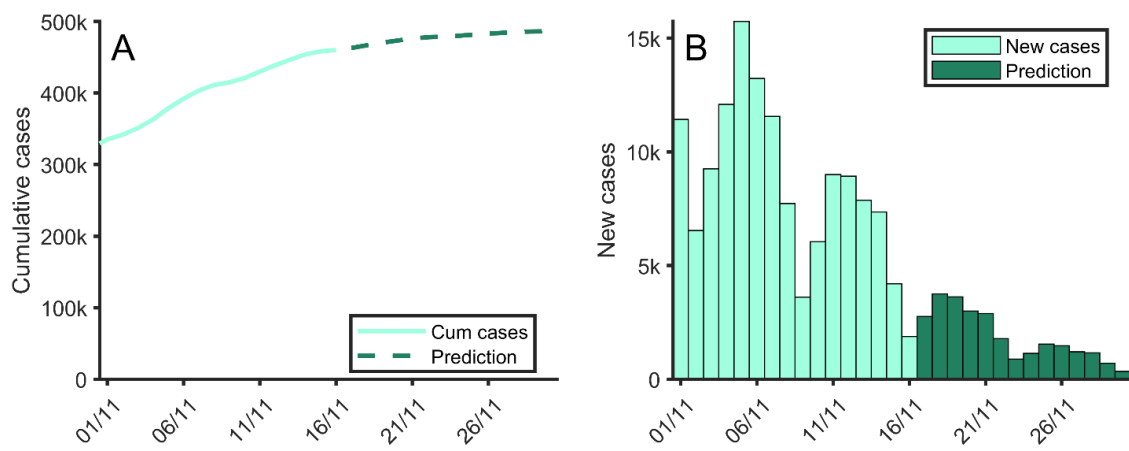
In order to illustrate the potentiality of this method, we show the obtained predictions for all EU+EFTA+UK countries as supplementary figures, below.



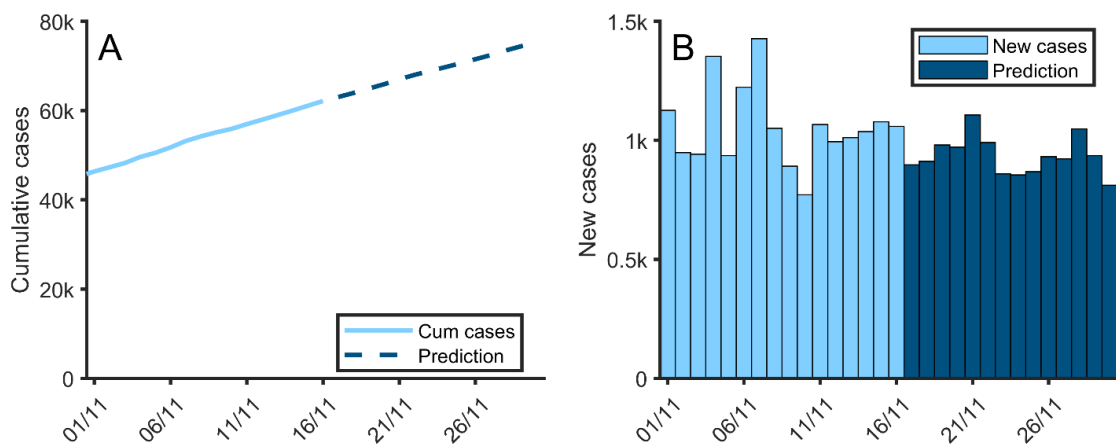
Cyprus



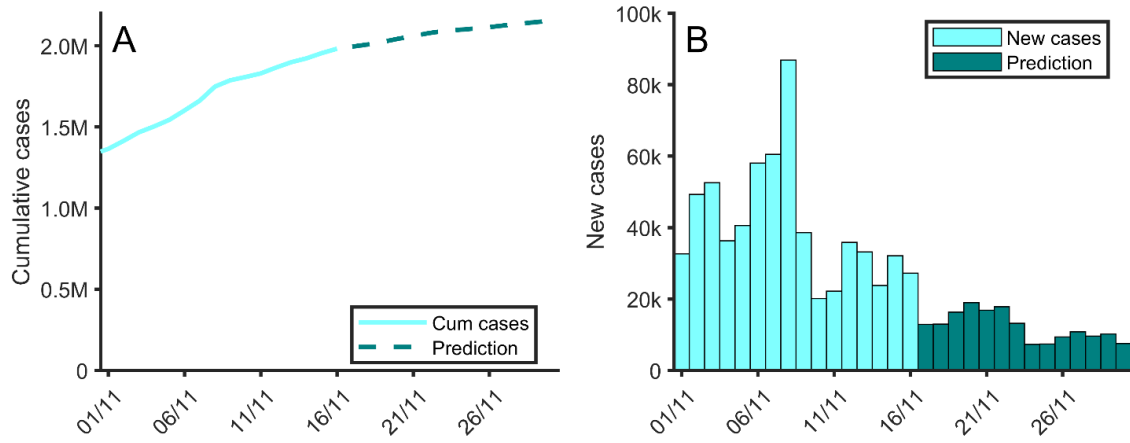
Czech_Republic



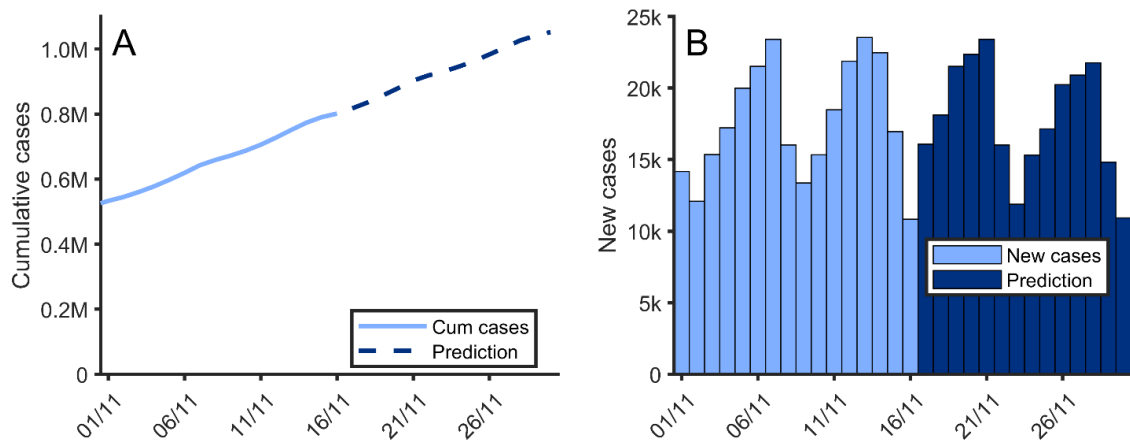
Denmark



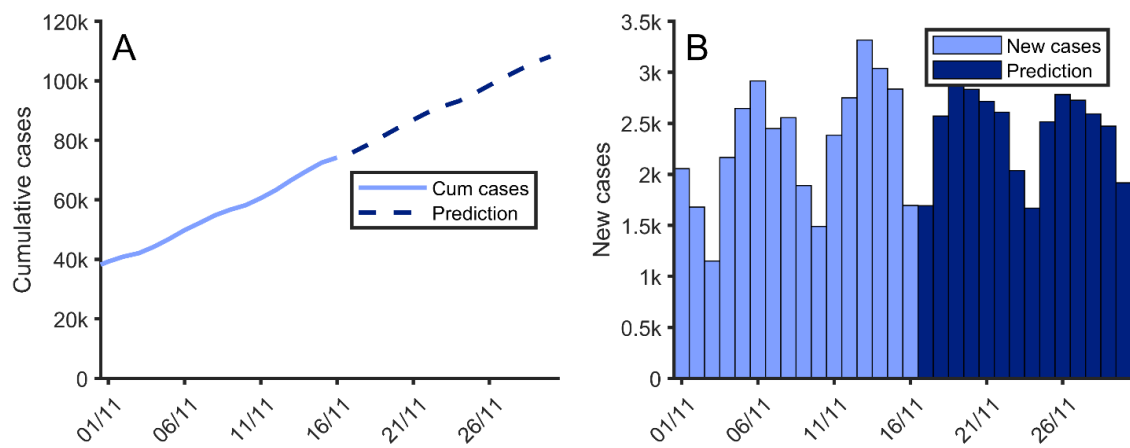
France



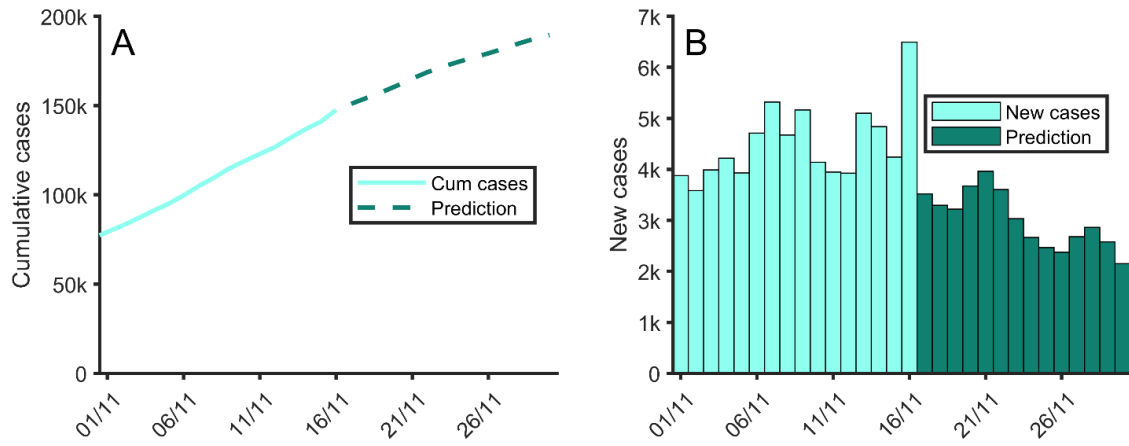
Germany



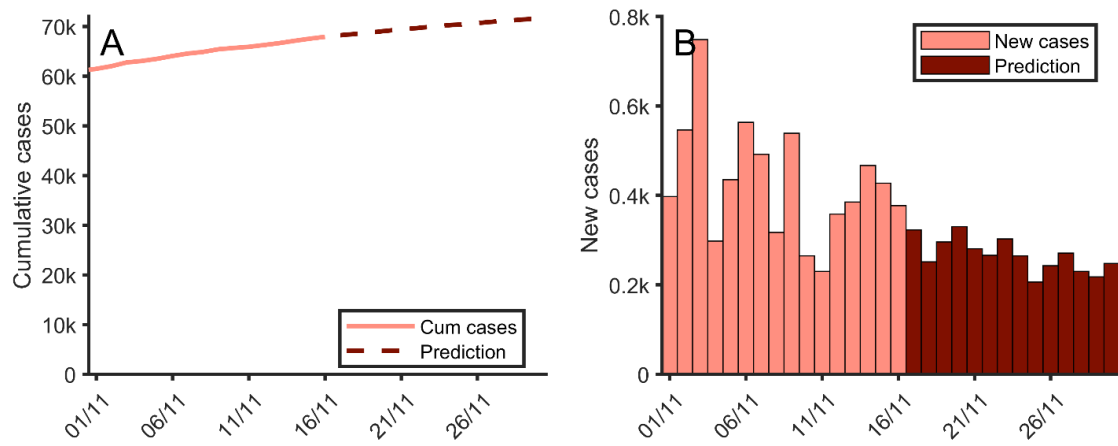
Greece



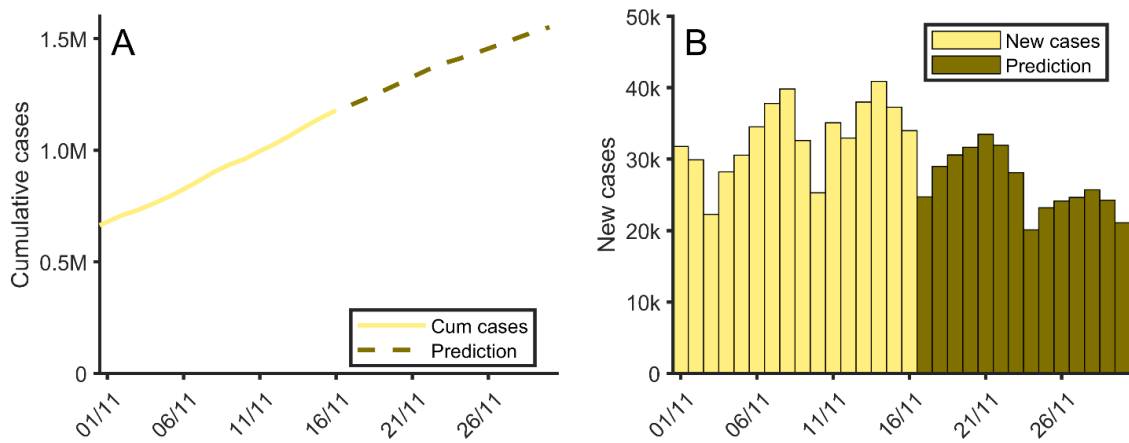
Hungary



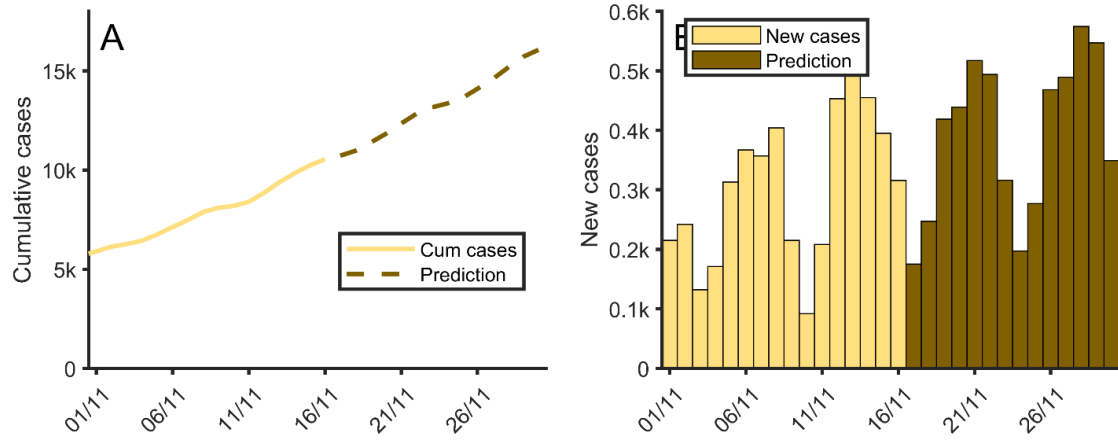
Ireland



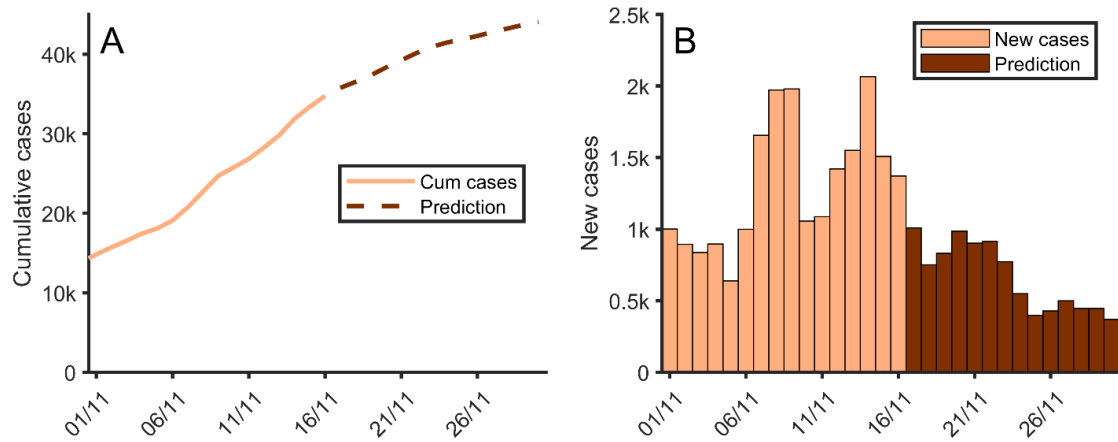
Italy



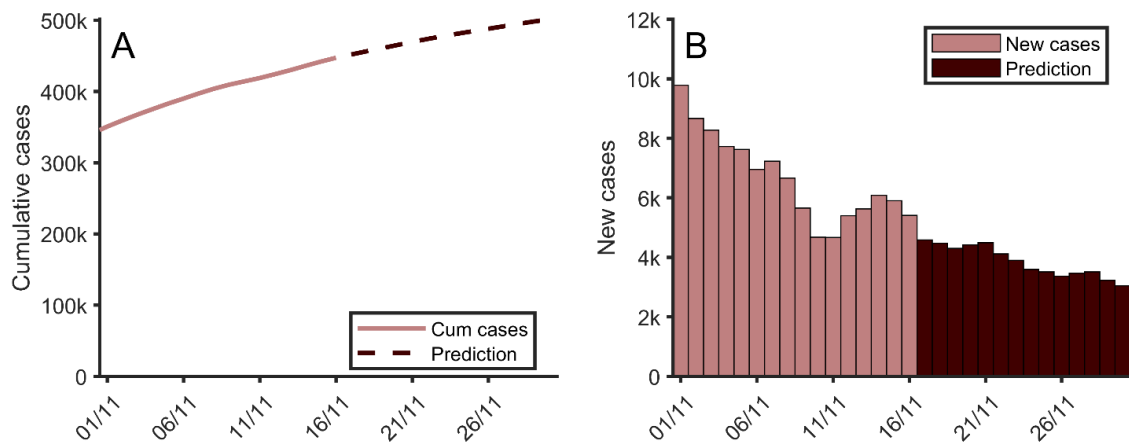
Latvia



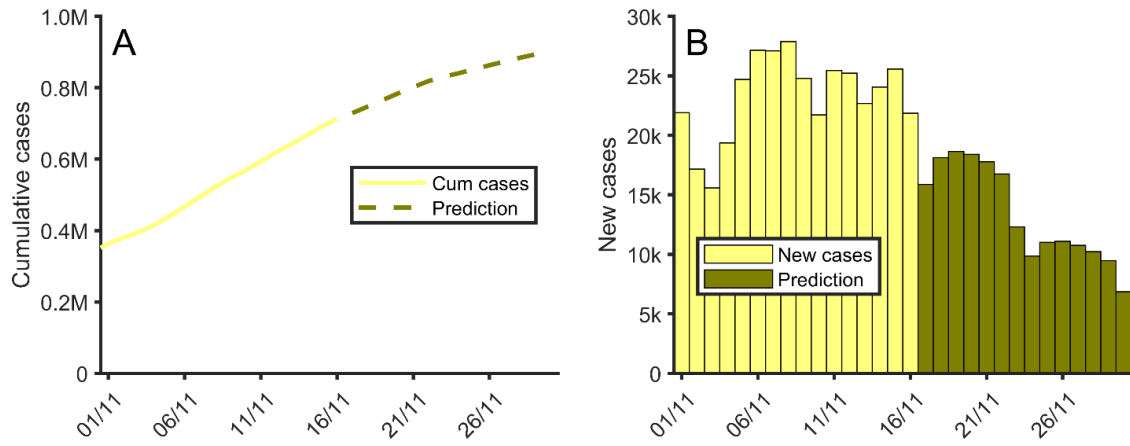
Lithuania



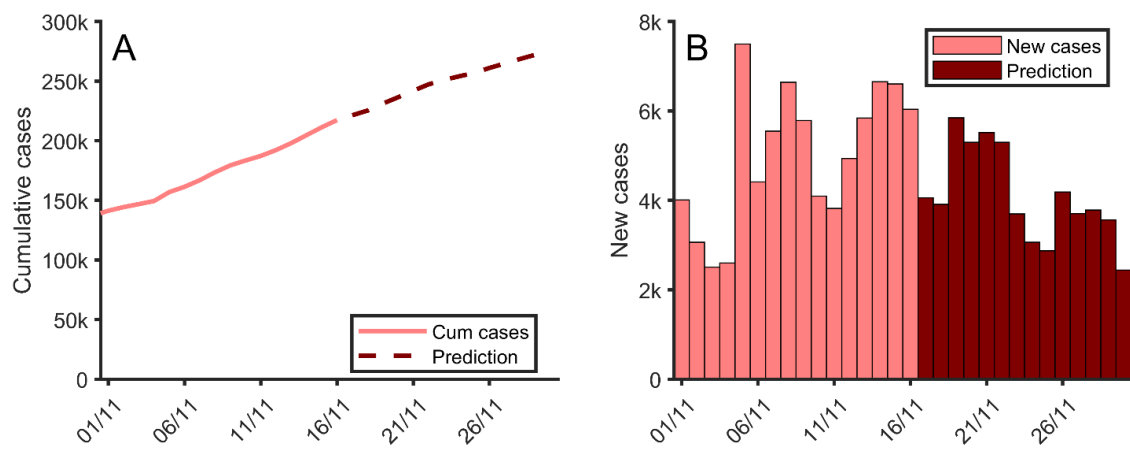
Netherlands



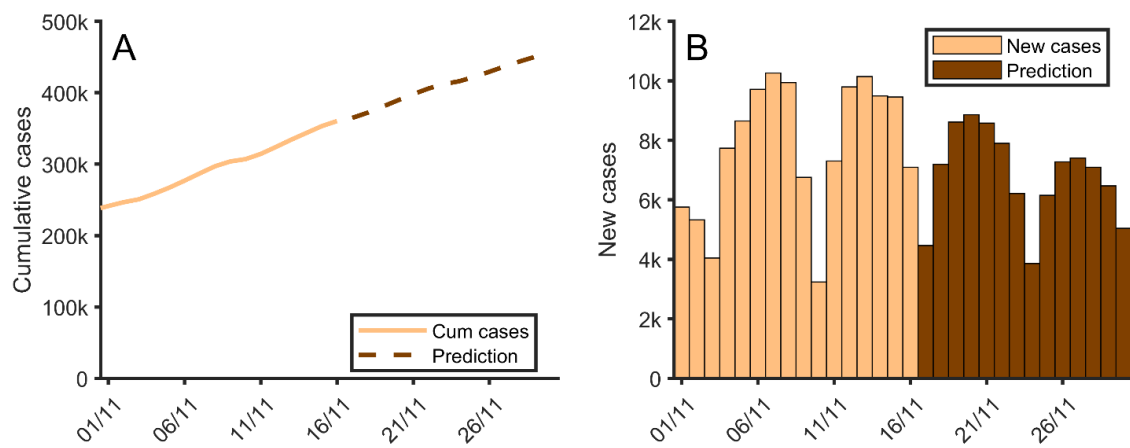
Poland



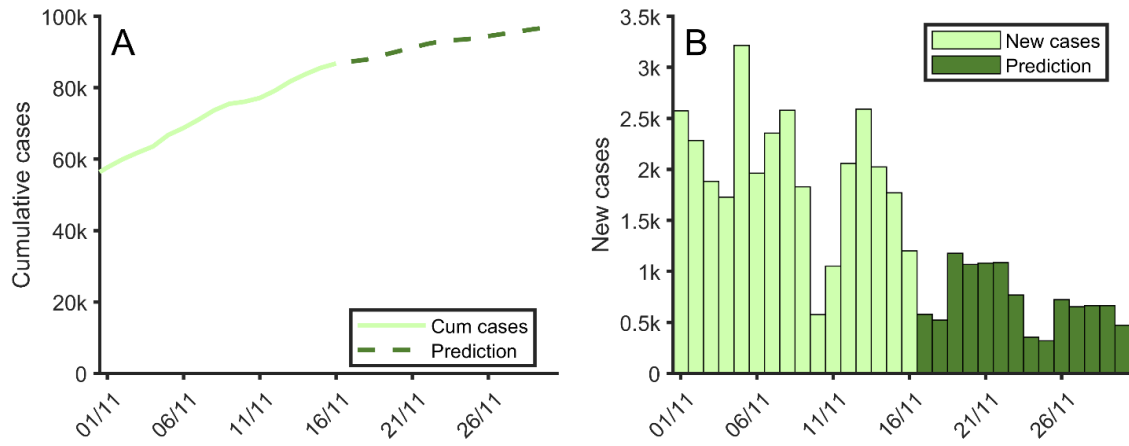
Portugal



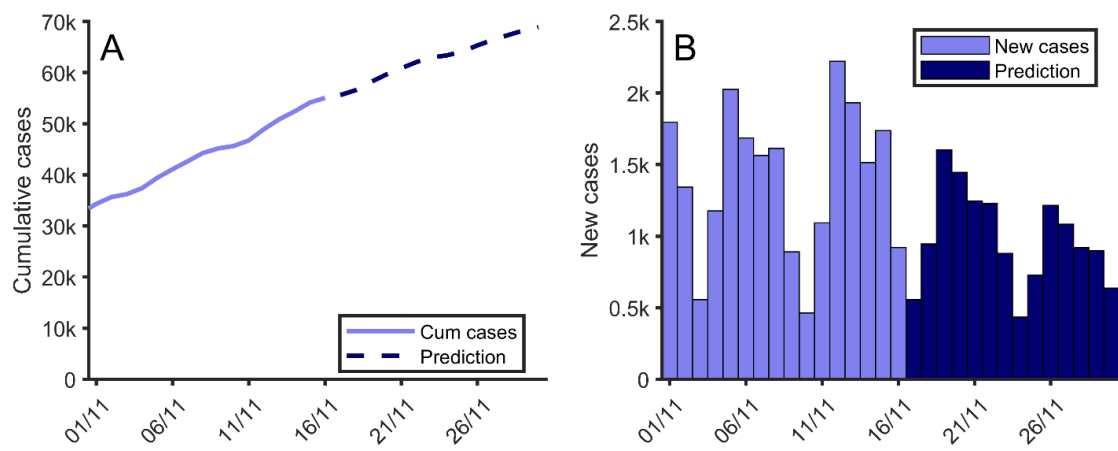
Romania



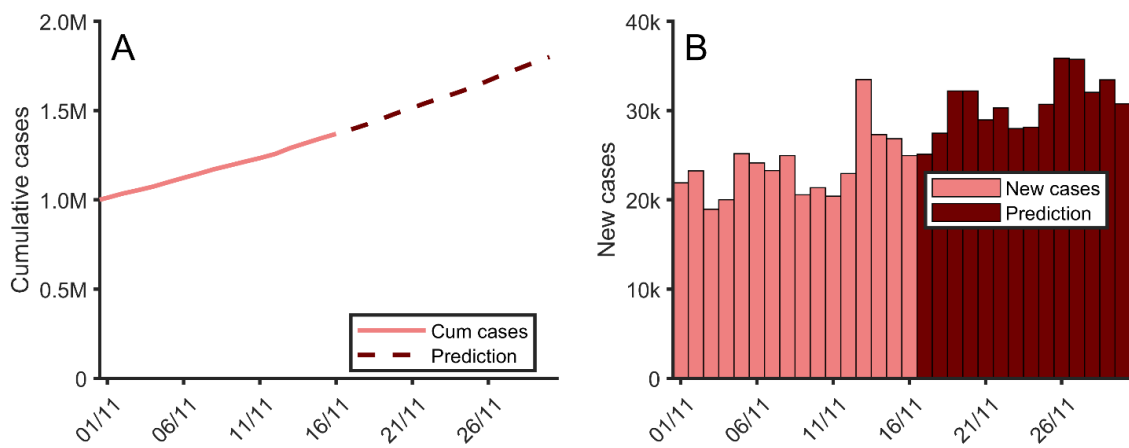
Slovakia



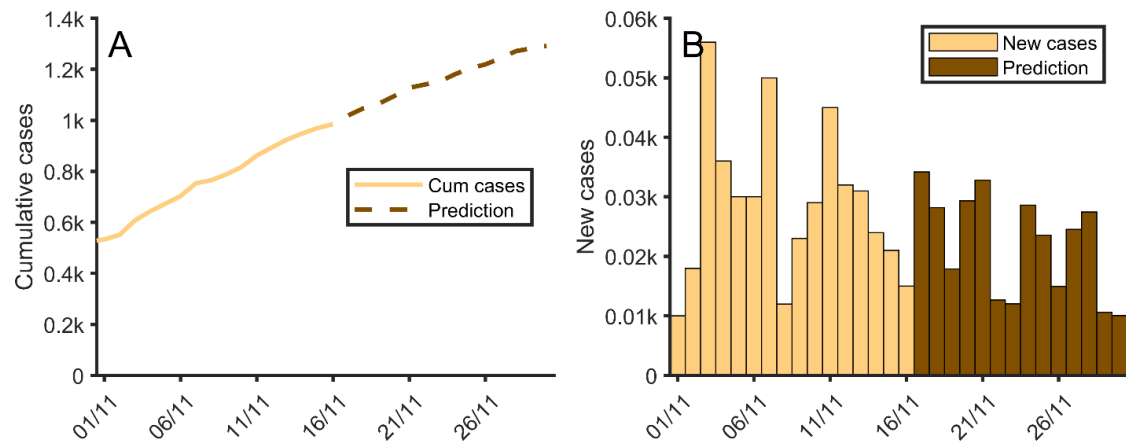
Slovenia



United Kingdom



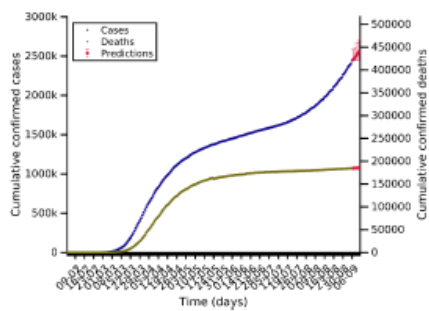
Liechtenstein



Legend: Countries' reports details

Reported cumulative cases (blue) and deaths (brown), together with predictions (red)

EU+EFTA+UK 06-09-2020. Pop: 2632.4M. Cumulative incidence: 93/10⁵

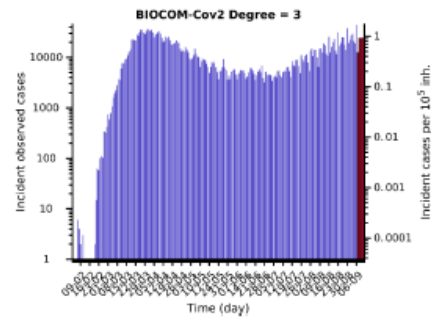
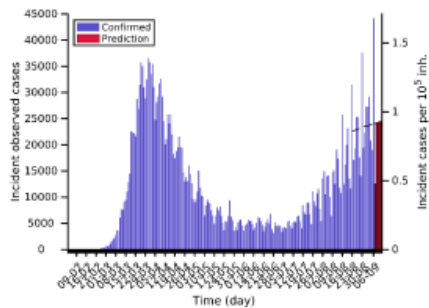


Predictions for next days		
Day	Number of cases	95% confidence interval
07-09-2020	2458068 (+125771)	[2445493 - 2586148]
09-09-2020	2568527 (+242758)	[2443483 - 2638980]
11-09-2020	2553558 (+244355)	[2445483 - 2798208]

Current indicators		
R_{eff}	RPI	CFR
1.3	14	1.17 %

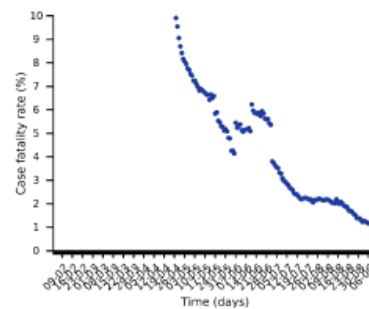
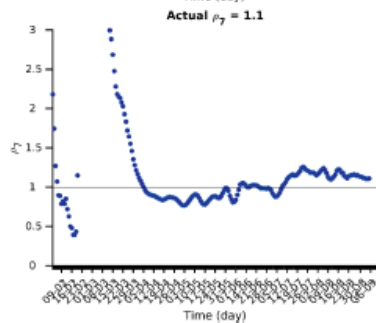
Predictions and indicators

Incident observed cases and predictions.



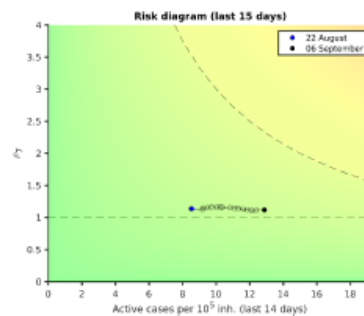
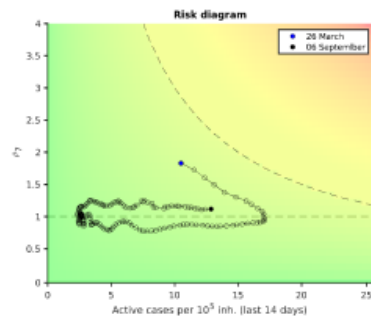
Incident observed cases in a logarithmic scale, with Biocom-Cov degree.

Evolution of empiric reproduction number ρ_T



Case fatality rate

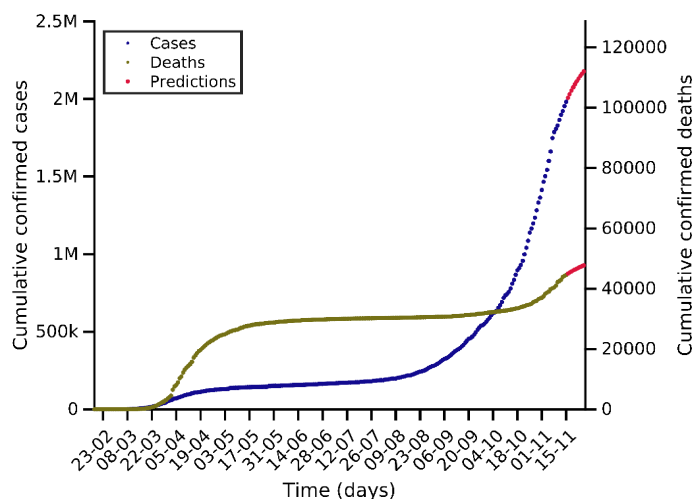
Risk diagram



Risk diagram of last 15 days

**(1) Analysis and prediction of COVID-19
for EU+EFTA+UK**

France 15-11-2020. Pop: 65.3M. Cumulative incidence: 3036/10⁵

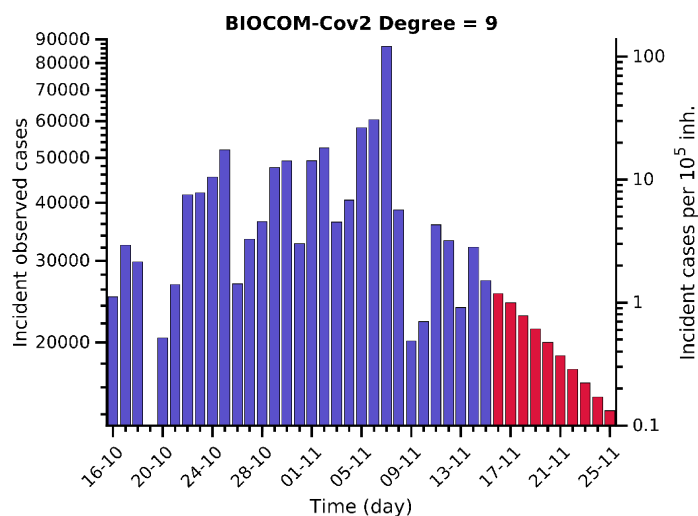
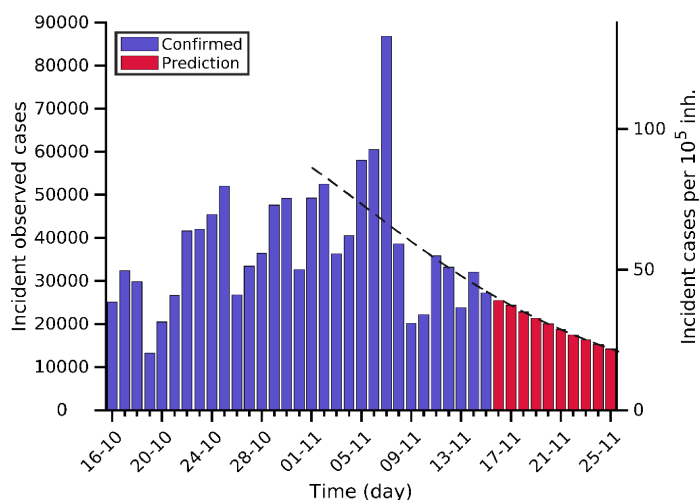


Predictions for next days

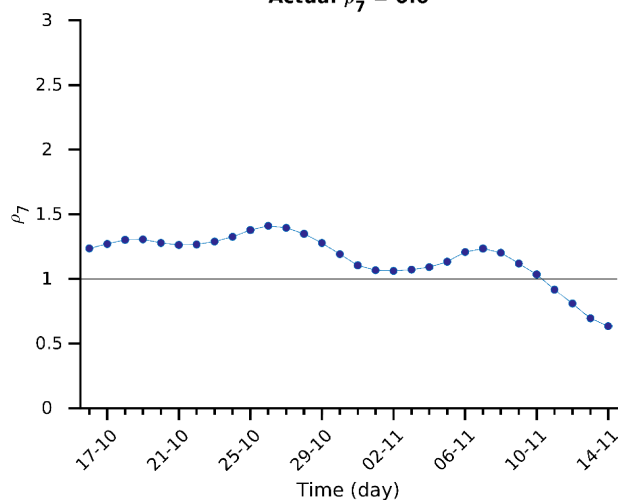
Day	Number of cases	95% Confidence Interval
18-11-2020	2054517 (+72690)	[1982145 - 2126888]
22-11-2020	2132153 (+150326)	[2022225 - 2242081]
25-11-2020	2178019 (+196192)	[2022714 - 2333324]

Current indicators

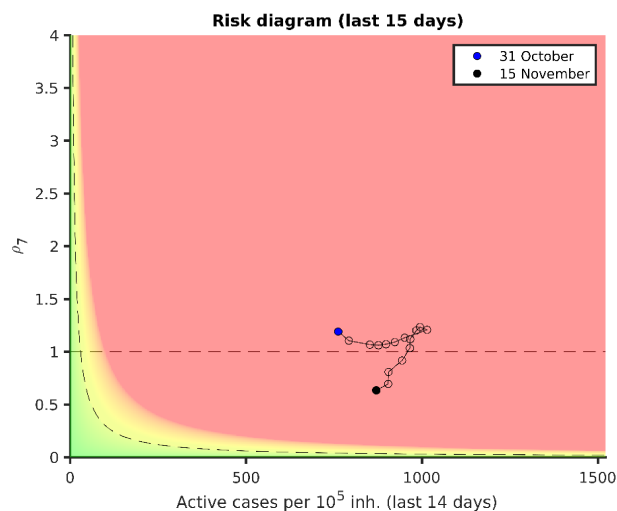
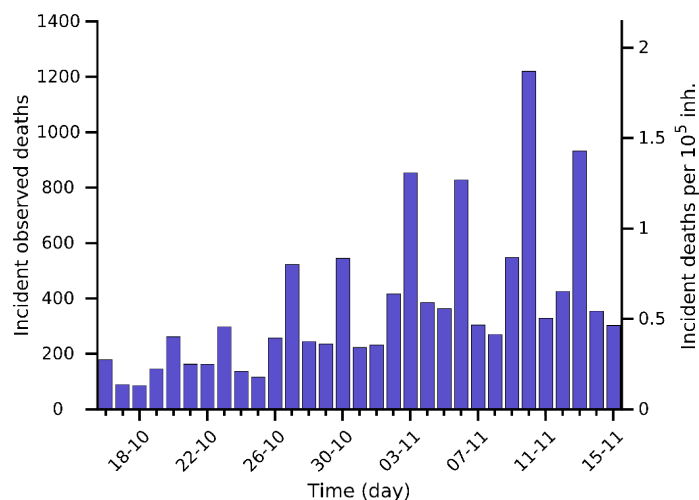
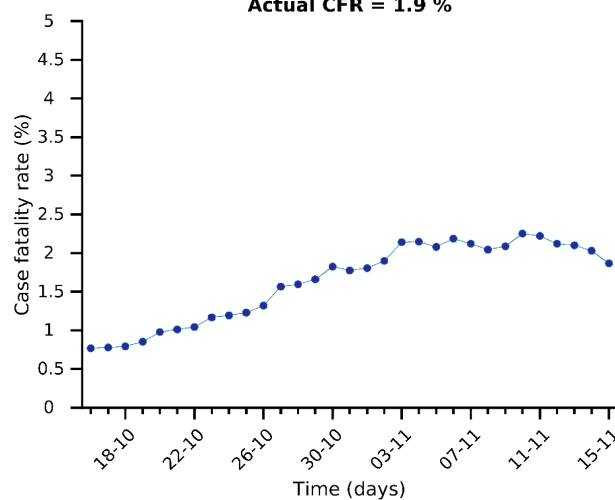
	A14	EPG	CFR	N7	D7
Today	870	552	1.87 %	27786	587
A Week ago	994	1227	2.04 %	53344	489
Maximum	1015	1227	4.94 %	54869	1101



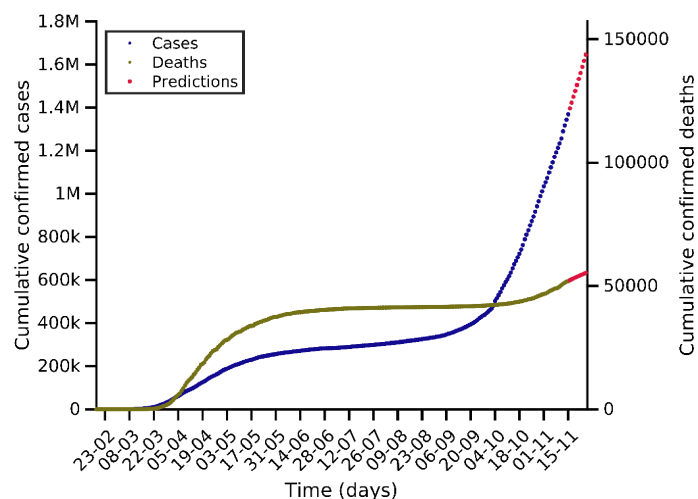
Actual $\rho_7 = 0.6$



Actual CFR = 1.9 %



UK 15-11-2020. Pop: 67.9M. Cumulative incidence: 2017/10⁵

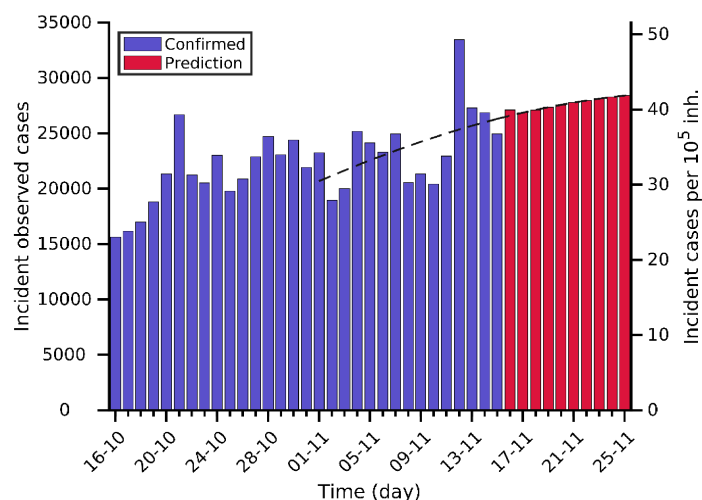


Predictions for next days

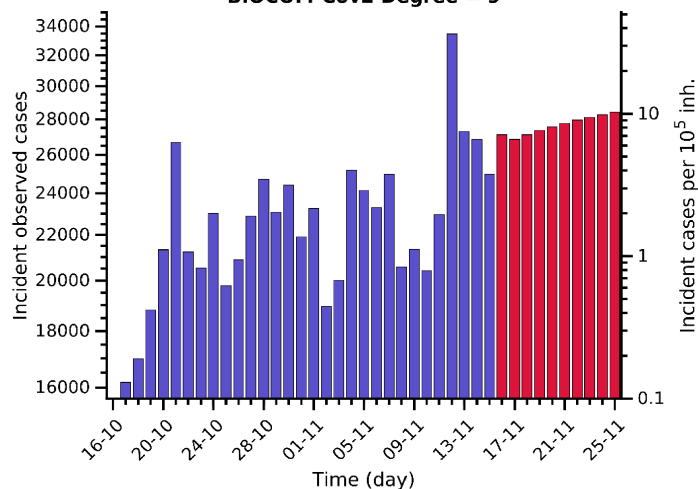
Day	Number of cases	95% Confidence Interval
18-11-2020	1450412 (+81094)	[1432453 - 1468371]
22-11-2020	1561064 (+191746)	[1520309 - 1601820]
25-11-2020	1645879 (+276561)	[1568431 - 1723326]

Current indicators

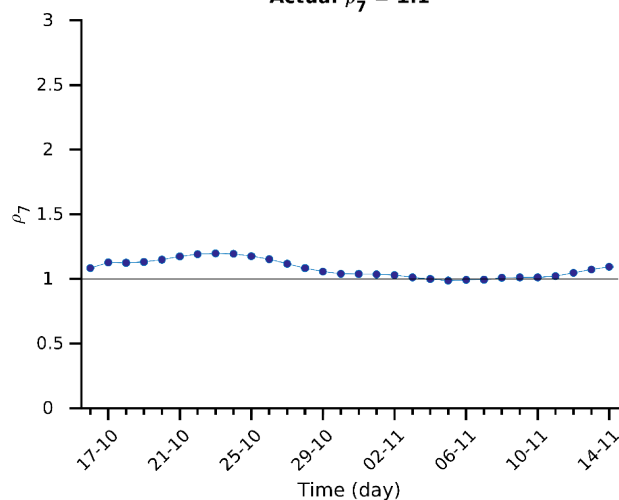
	A14	EPG	CFR	N7	D7
Today	493	539	1.93 %	25329	413
A Week ago	469	466	1.89 %	22443	332
Maximum	493	539	4.95 %	25329	942



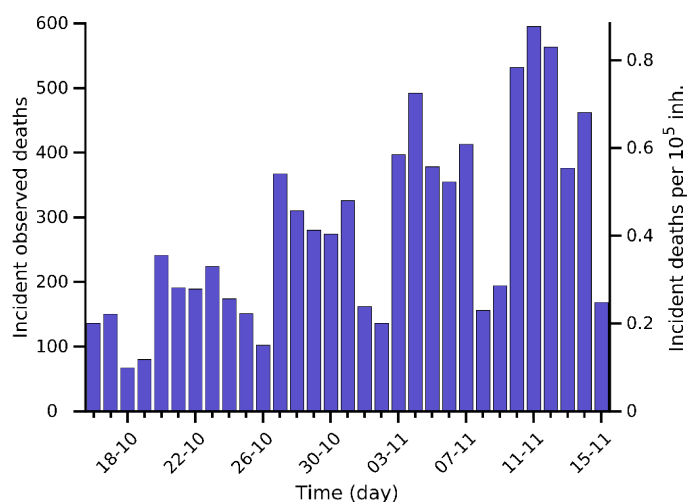
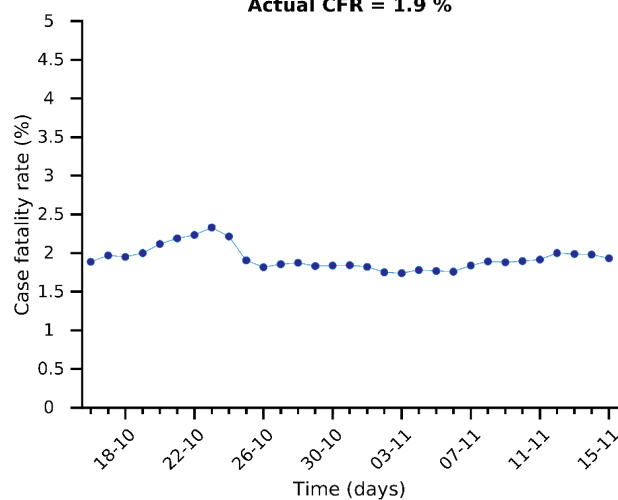
BIOCOM-Cov2 Degree = 9



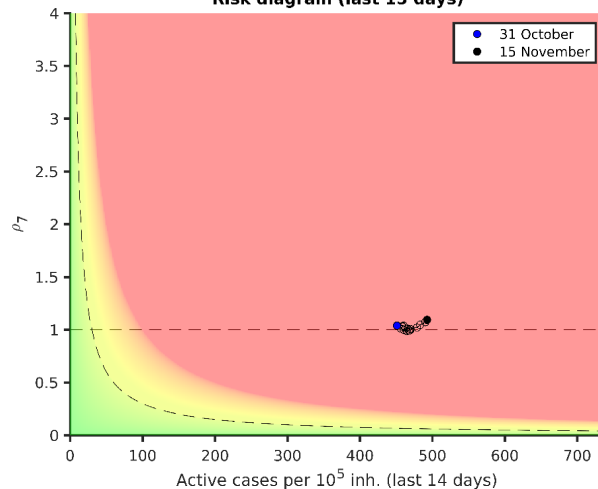
Actual $\rho_7 = 1.1$



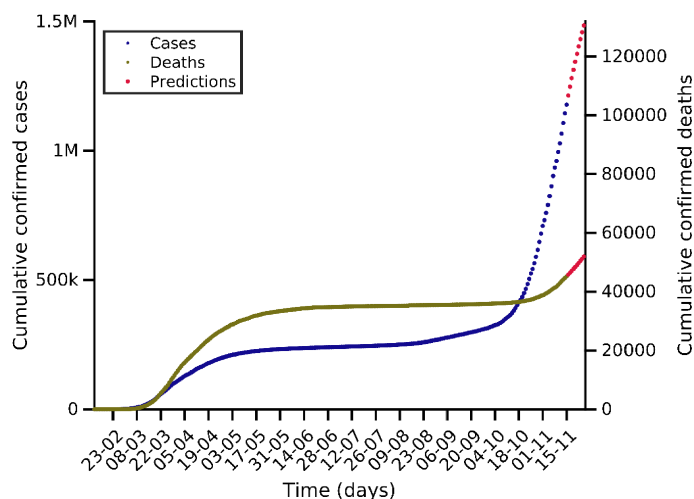
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Italy 15-11-2020. Pop: 60.5M. Cumulative incidence: 1949/10⁵

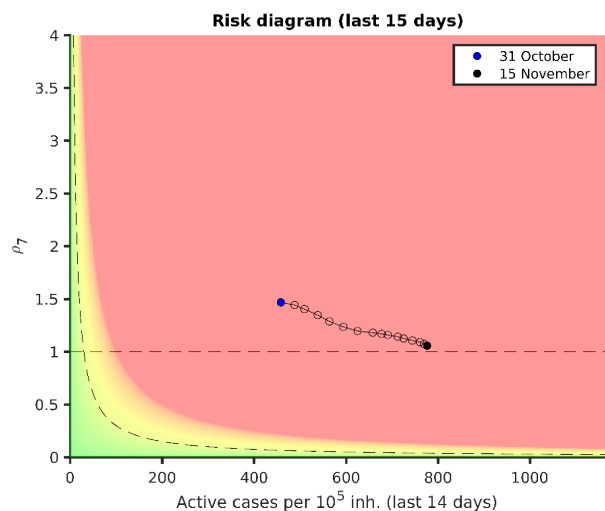
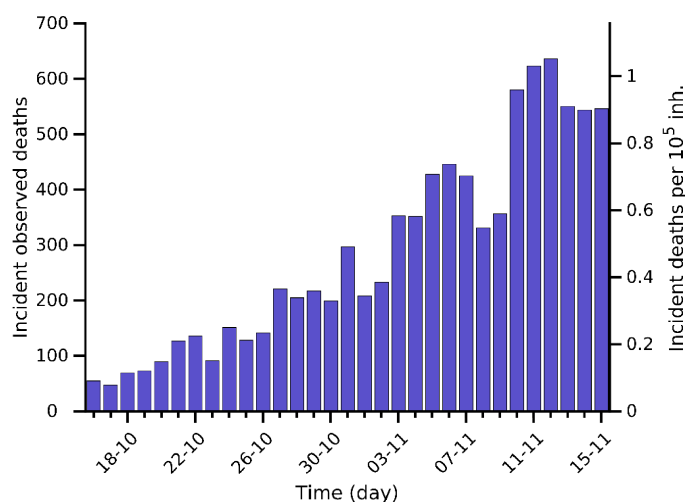
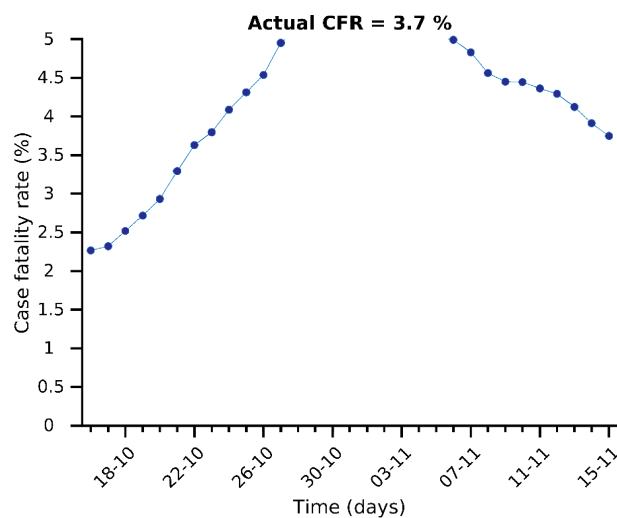
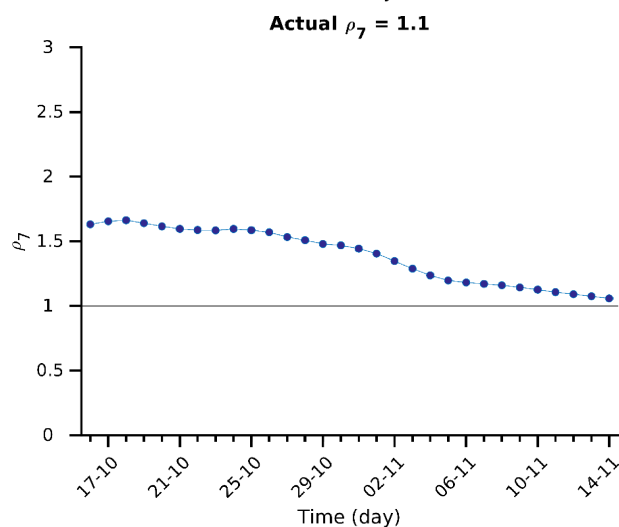
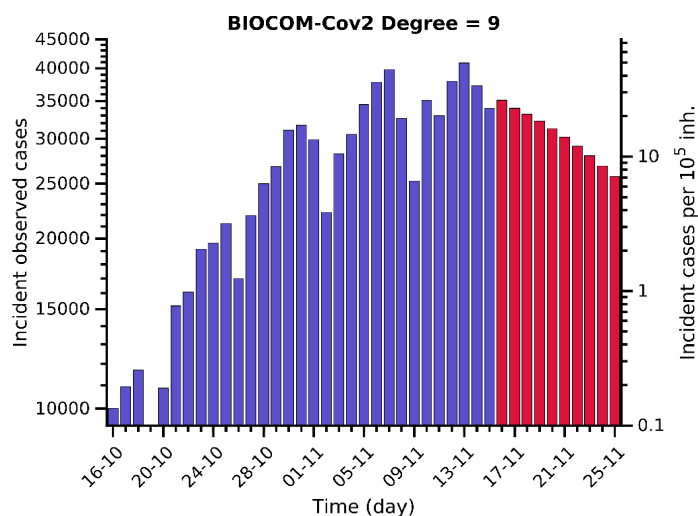
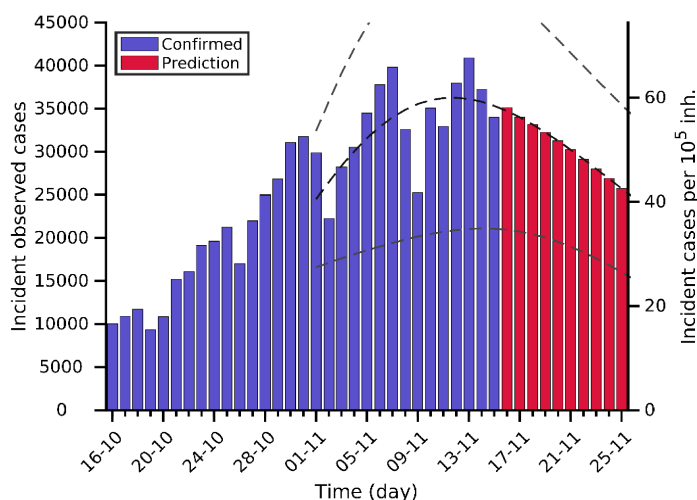


Predictions for next days

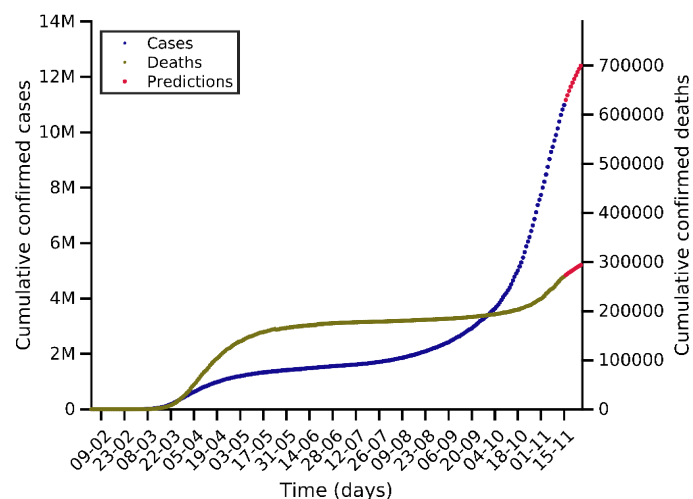
Day	Number of cases	95% Confidence Interval
18-11-2020	1280853 (+102324)	[1259707 - 1301999]
22-11-2020	1403756 (+225227)	[1366789 - 1440724]
25-11-2020	1484409 (+305880)	[1425838 - 1542980]

Current indicators

	A14	EPG	CFR	N7	D7
Today	776	821	3.75 %	34775	548
A Week ago	677	792	4.56 %	32253	367
Maximum	776	829	4.99 %	34946	822



EU+EFTA+UK 15-11-2020. Pop: 527.9M. Cumulative incidence: 2081/10⁵

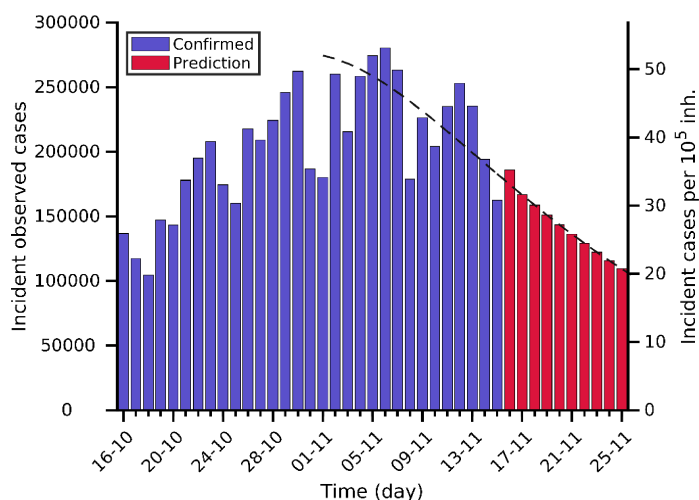


Predictions for next days

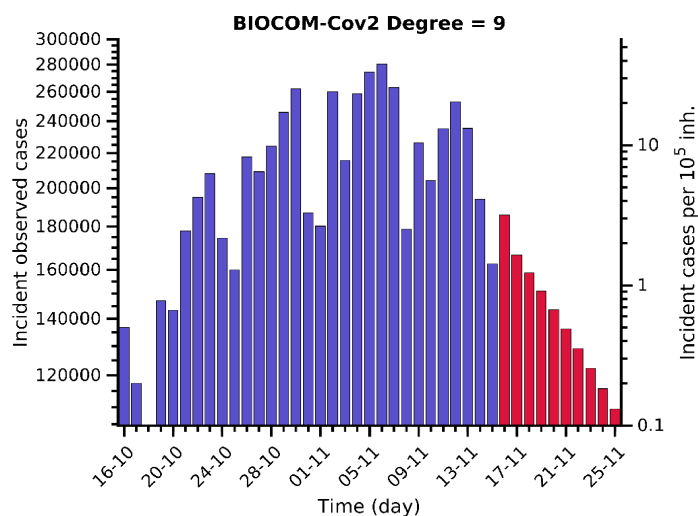
Day	Number of cases	95% Confidence Interval
18-11-2020	11494994 (+511257)	[11249741 - 11740247]
22-11-2020	12054860 (+1071123)	[11677728 - 12431992]
25-11-2020	12402324 (+1418587)	[11847473 - 12957175]

Current indicators

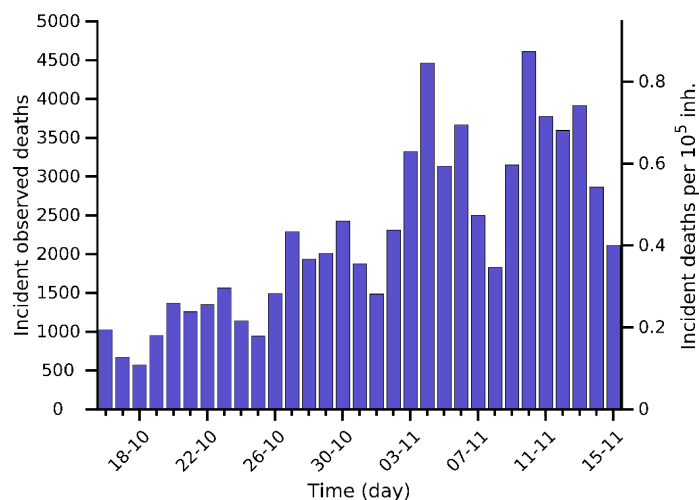
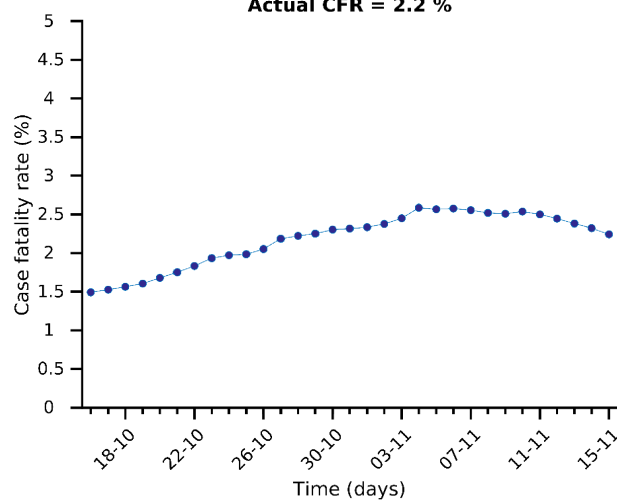
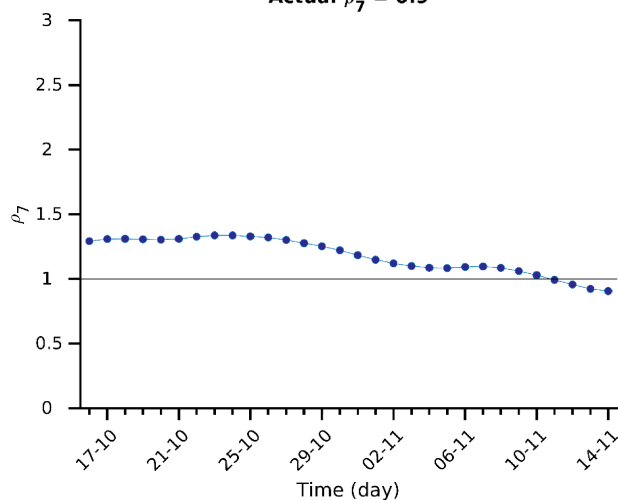
	A14	EPG	CFR	N7	D7
Today	614	556	2.24 %	215813	3432
A Week ago	617	676	2.52 %	247274	3032
Maximum	621	676	5.00 %	247490	4272



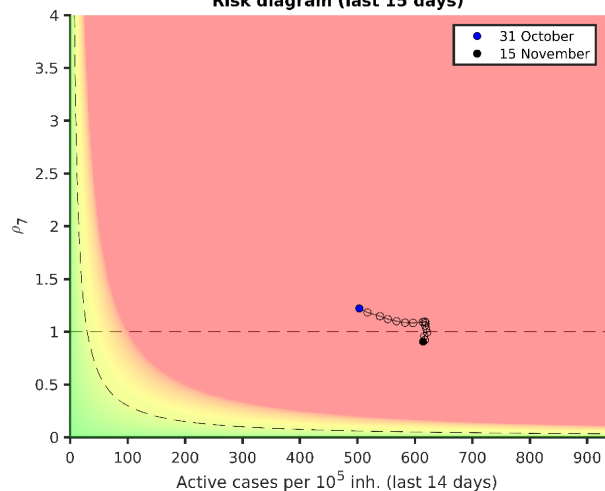
Actual $\rho_7 = 0.9$



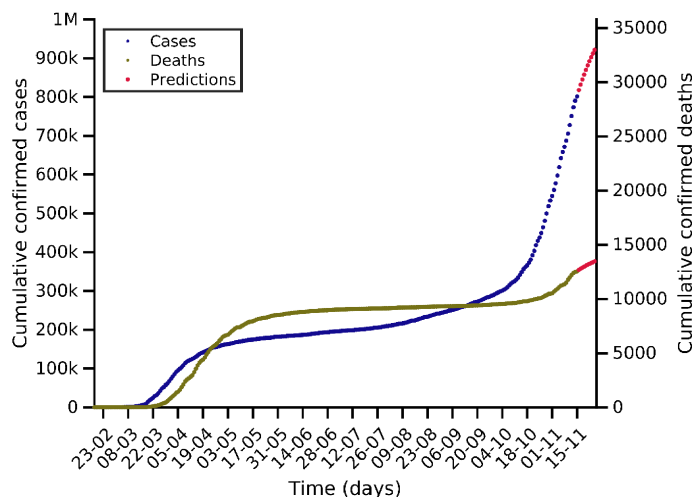
Actual CFR = 2.2 %



Risk diagram (last 15 days)



Germany 15-11-2020. Pop: 83.8M. Cumulative incidence: 956/10⁵

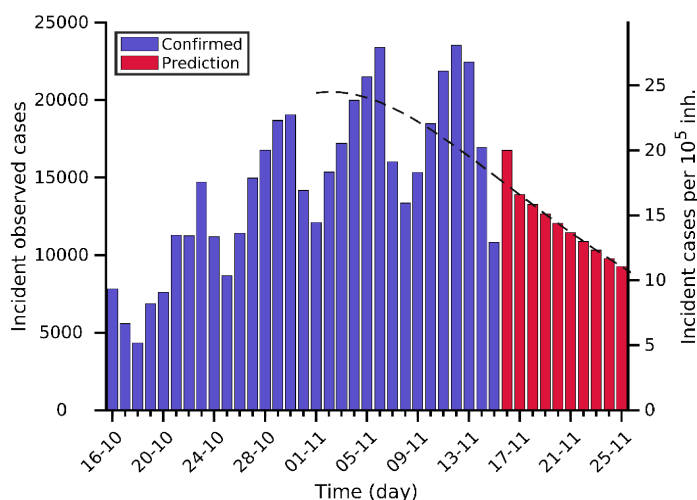


Predictions for next days

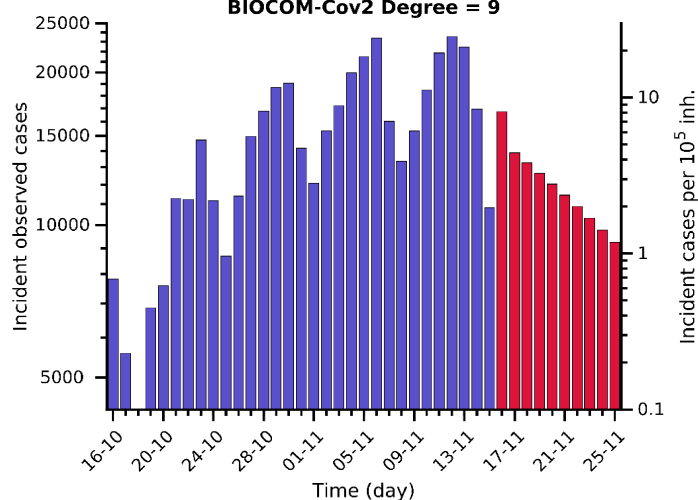
Day	Number of cases	95% Confidence Interval
18-11-2020	845237 (+43910)	[801327 - 890849]
22-11-2020	892278 (+90951)	[821309 - 963248]
25-11-2020	921635 (+120308)	[816515 - 1026754]

Current indicators

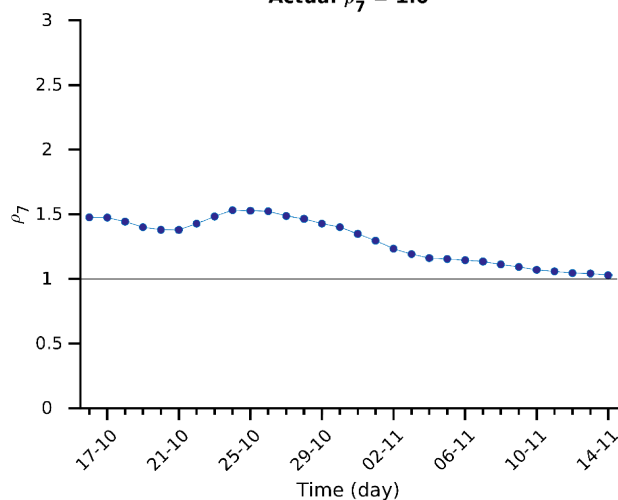
	A14	EPG	CFR	N7	D7
Today	306	315	1.79 %	18494	171
A Week ago	279	317	1.97 %	18120	117
Maximum	307	320	4.57 %	18858	233



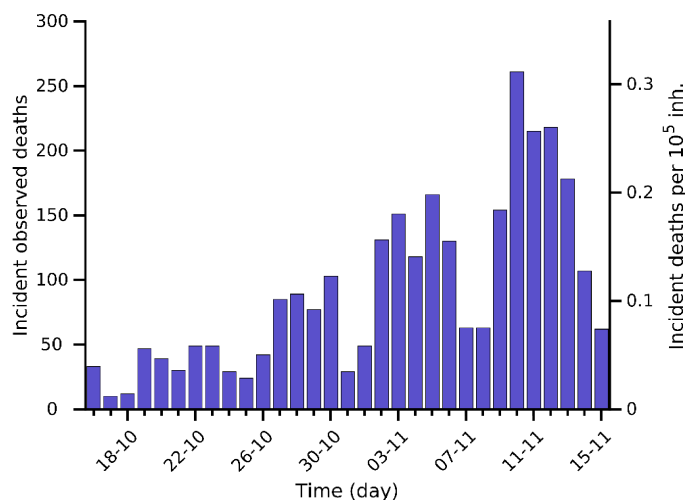
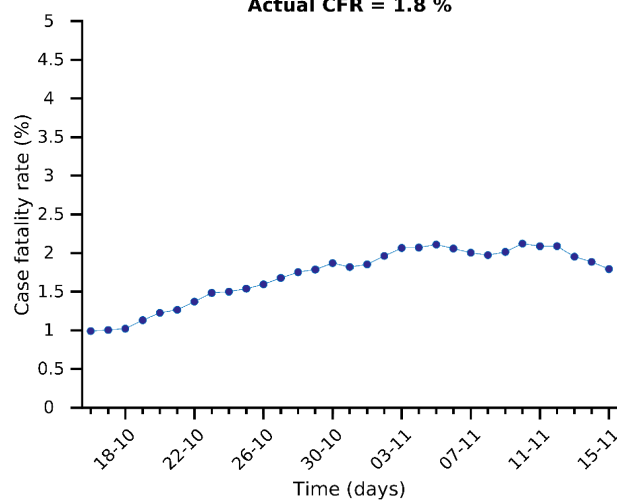
BIOCOM-Cov2 Degree = 9



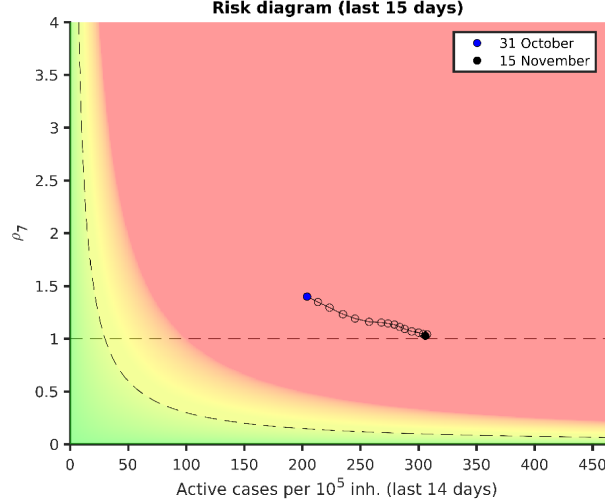
Actual $\rho_7 = 1.0$



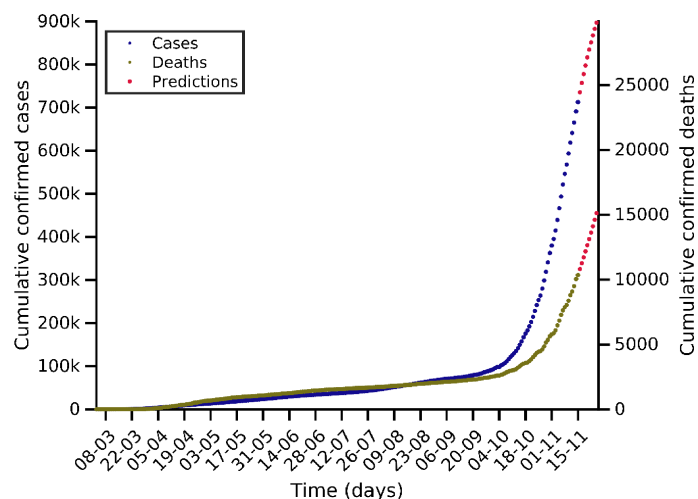
Actual CFR = 1.8 %



Risk diagram (last 15 days)



Poland 15-11-2020. Pop: 37.8M. Cumulative incidence: 1884/10⁵

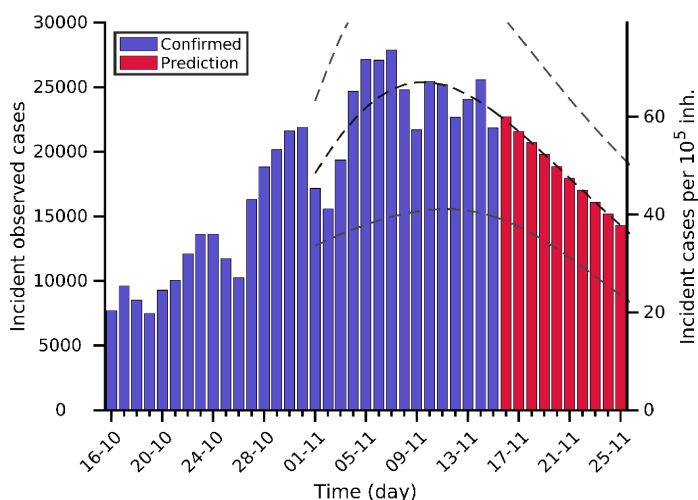


Predictions for next days

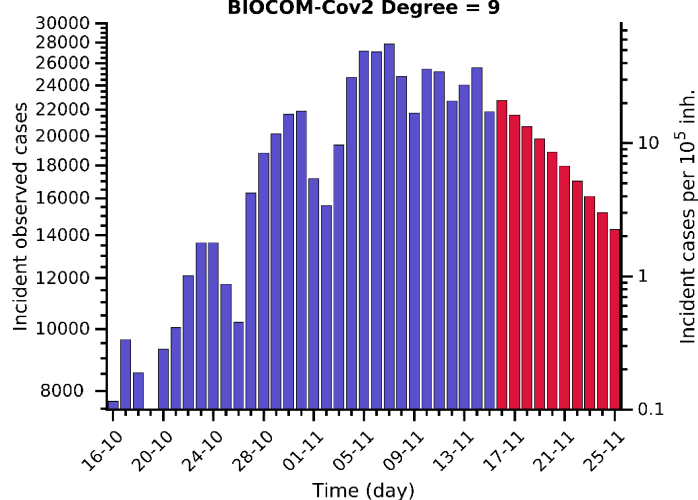
Day	Number of cases	95% Confidence Interval
18-11-2020	777981 (+65009)	[760592 - 795369]
22-11-2020	851638 (+138666)	[823946 - 879330]
25-11-2020	897221 (+184249)	[856129 - 938312]

Current indicators

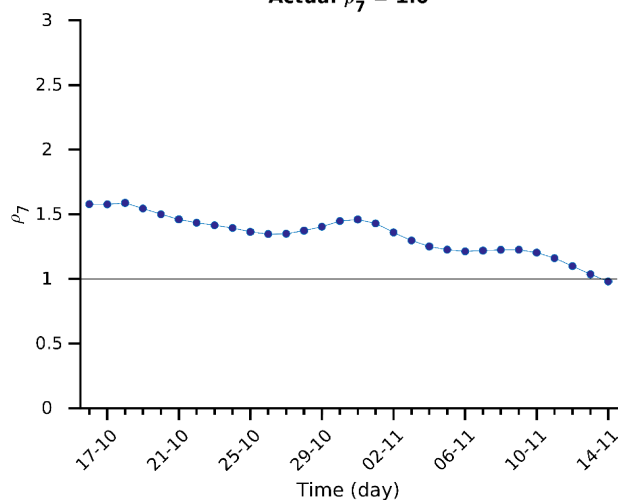
	A14	EPG	CFR	N7	D7
Today	880	863	3.57 %	23792	354
A Week ago	773	943	4.42 %	23789	298
Maximum	880	1017	5.00 %	25611	354



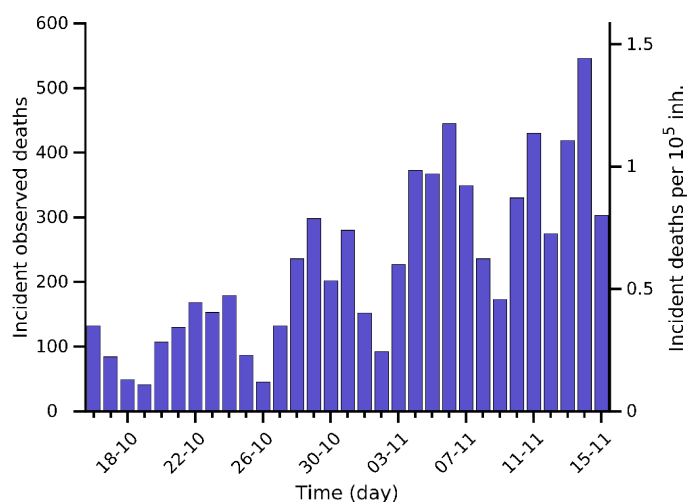
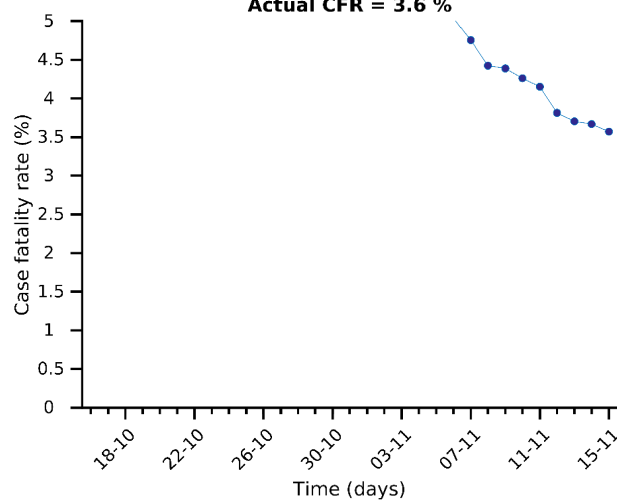
BIOCOM-Cov2 Degree = 9



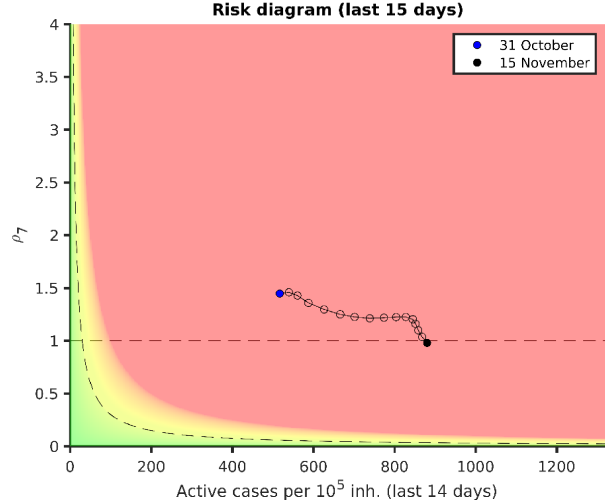
Actual $\rho_7 = 1.0$



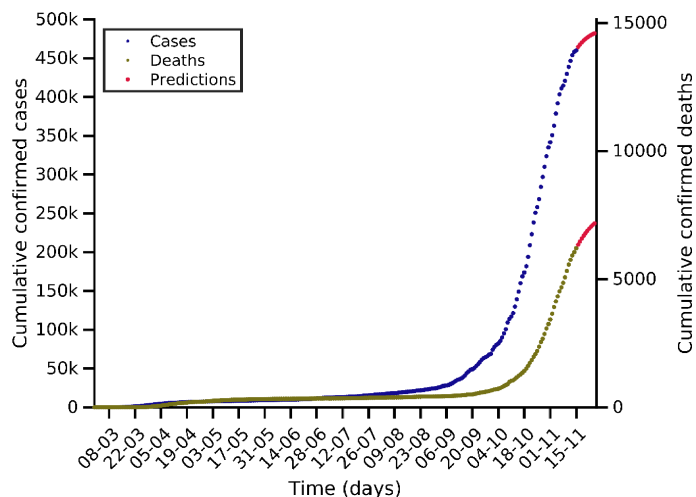
Actual CFR = 3.6 %



Risk diagram (last 15 days)



Czech Rep 15-11-2020. Pop: 10.7M. Cumulative incidence: 4297/10⁵

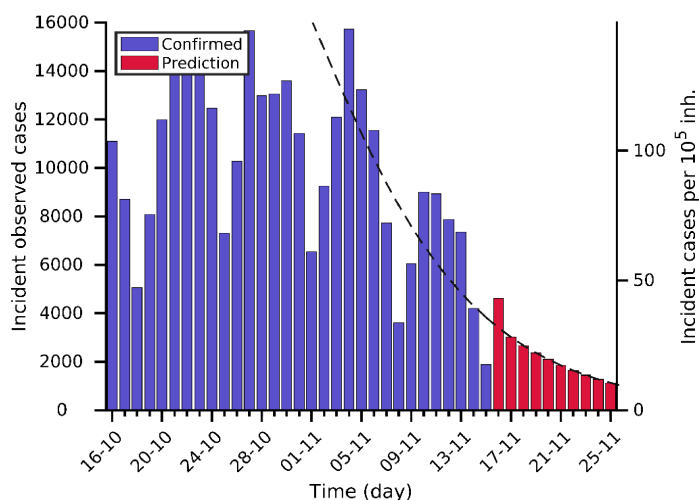


Predictions for next days

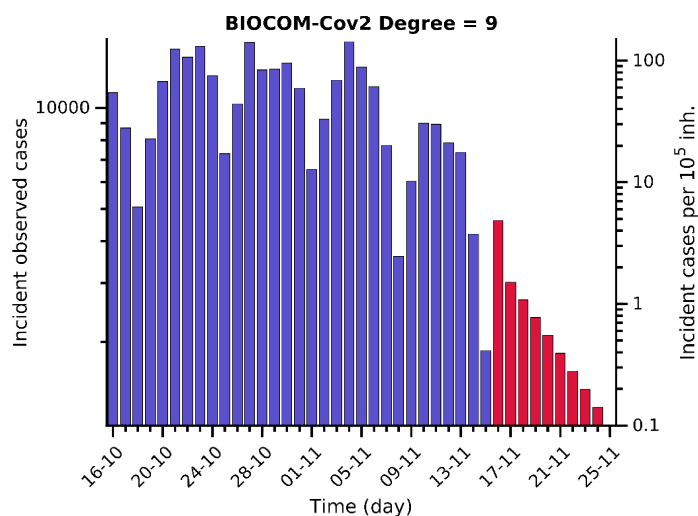
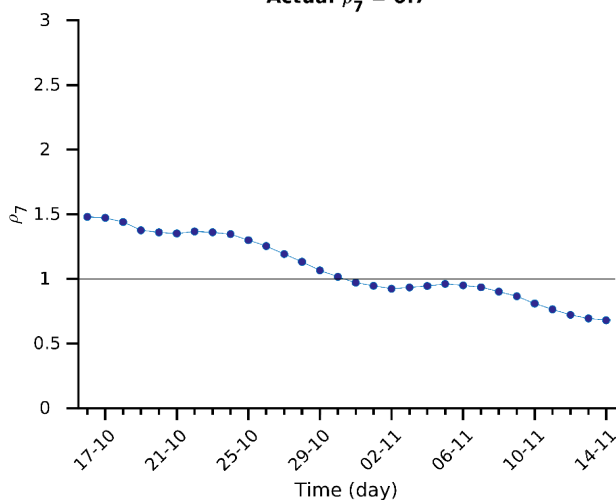
Day	Number of cases	95% Confidence Interval
18-11-2020	470413 (+10297)	[460116 - 493149]
22-11-2020	478361 (+18245)	[460116 - 505211]
25-11-2020	482210 (+22094)	[460116 - 513317]

Current indicators

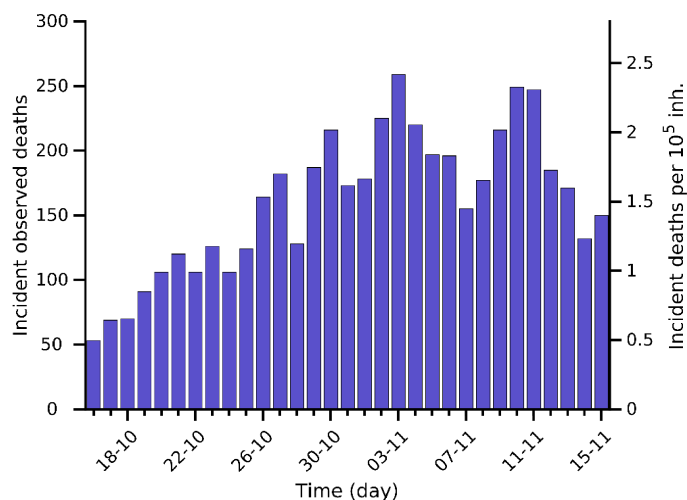
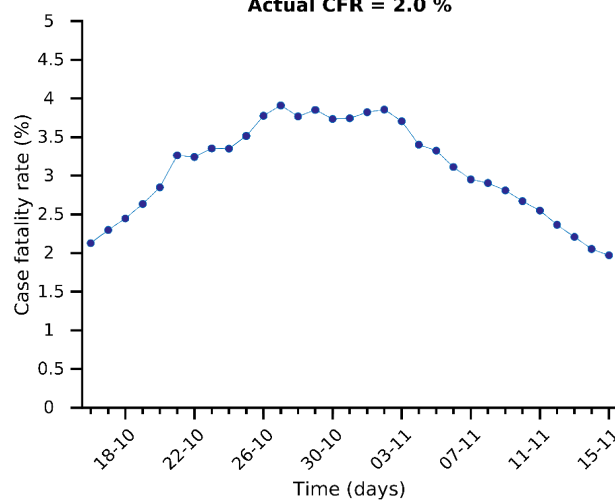
	A14	EPG	CFR	N7	D7
Today	1106	752	1.97 %	6470	193
A Week ago	1464	1369	2.91 %	10455	204
Maximum	1586	1807	4.98 %	12870	210



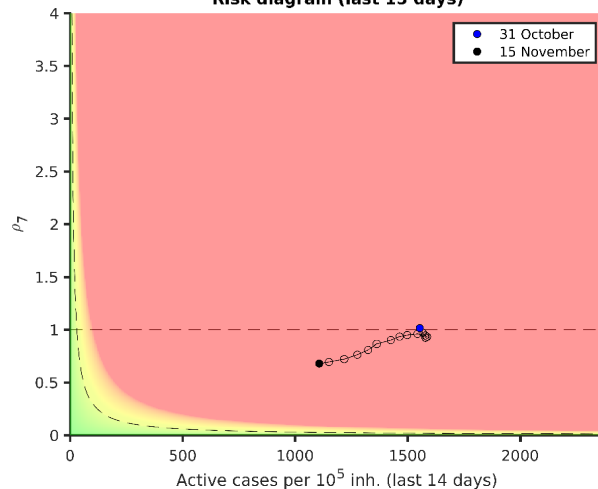
Actual $\rho_7 = 0.7$



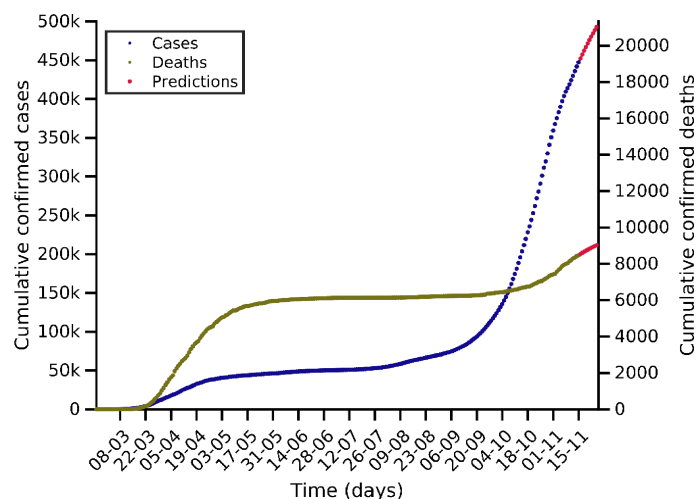
Actual CFR = 2.0 %



Risk diagram (last 15 days)



Netherlands 15-11-2020. Pop: 17.1M. Cumulative incidence: 2611/10⁵

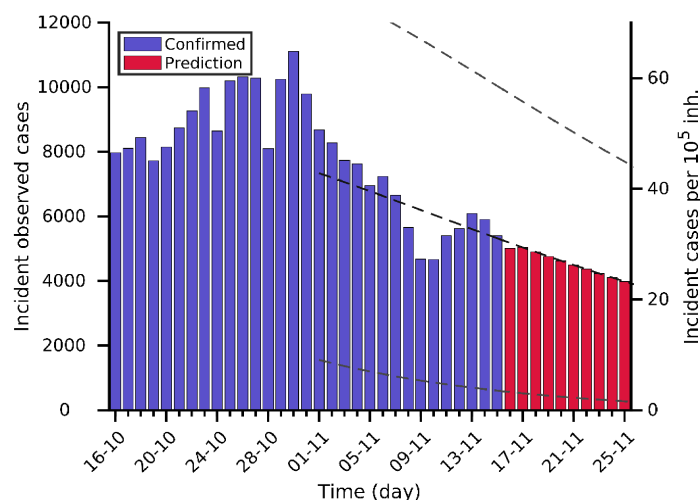


Predictions for next days

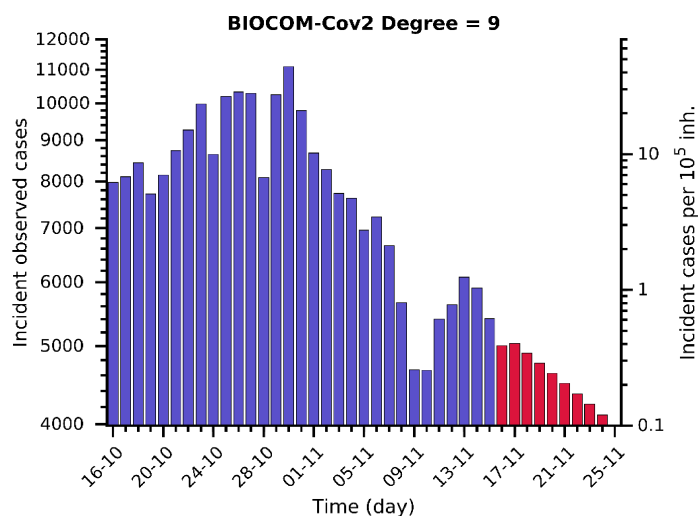
Day	Number of cases	95% Confidence Interval
18-11-2020	462277 (+14942)	[454400 - 470155]
22-11-2020	480522 (+33187)	[470622 - 490423]
25-11-2020	492849 (+45514)	[480795 - 504904]

Current indicators

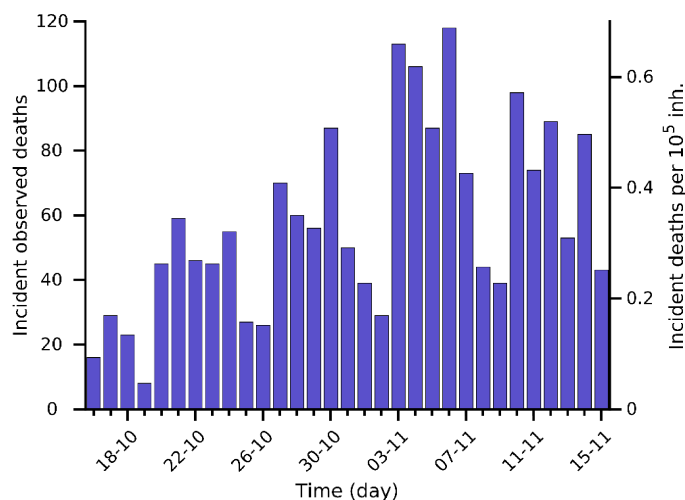
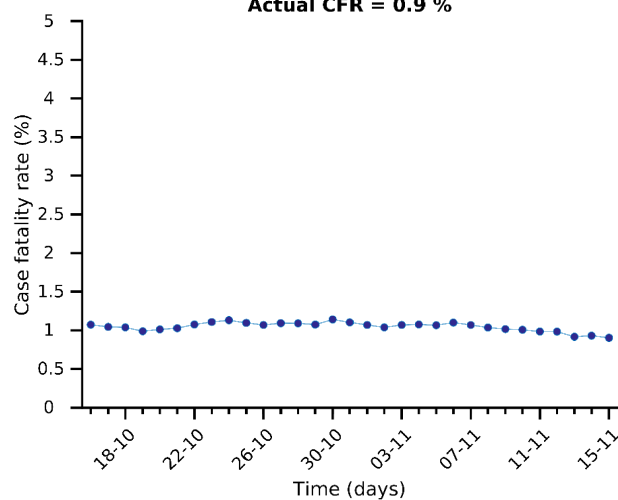
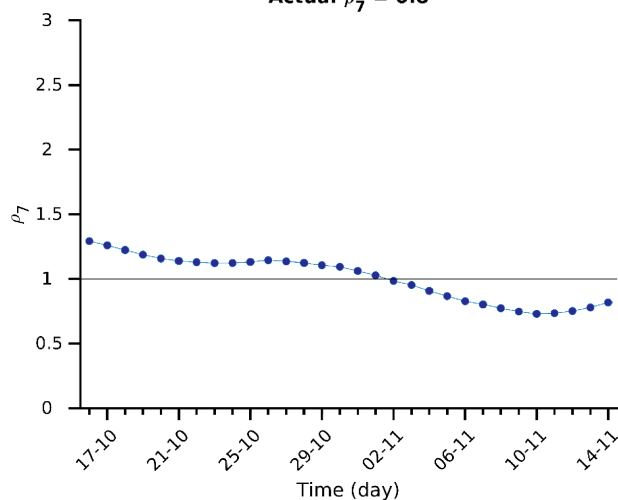
	A14	EPG	CFR	N7	D7
Today	513	419	0.90 %	5395	69
A Week ago	692	556	1.04 %	7162	81
Maximum	769	836	4.98 %	10005	154



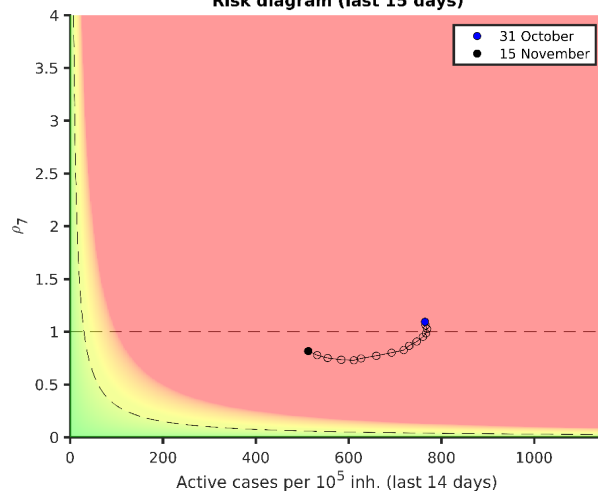
Actual $\rho_7 = 0.8$



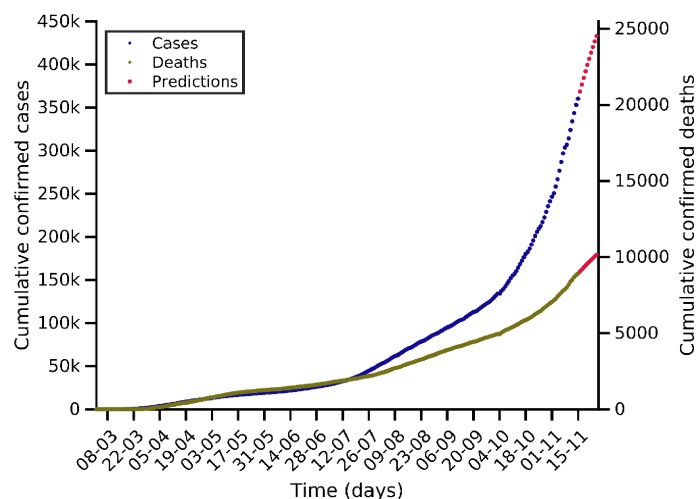
Actual CFR = 0.9 %



Risk diagram (last 15 days)



Romania 15-11-2020. Pop: 19.2M. Cumulative incidence: 1873/10⁵

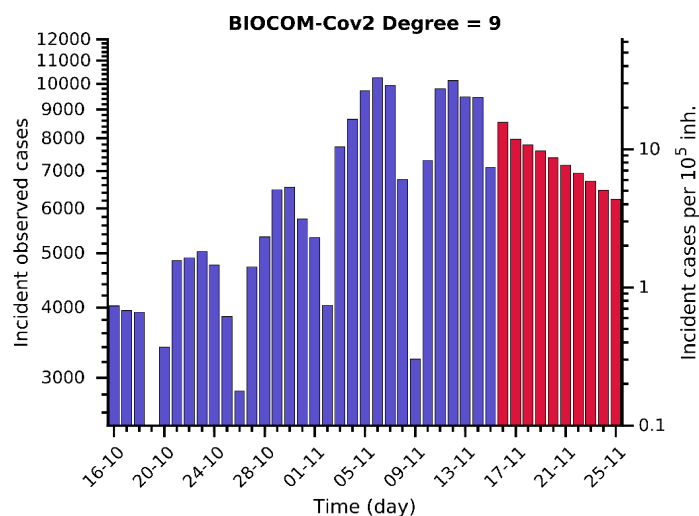
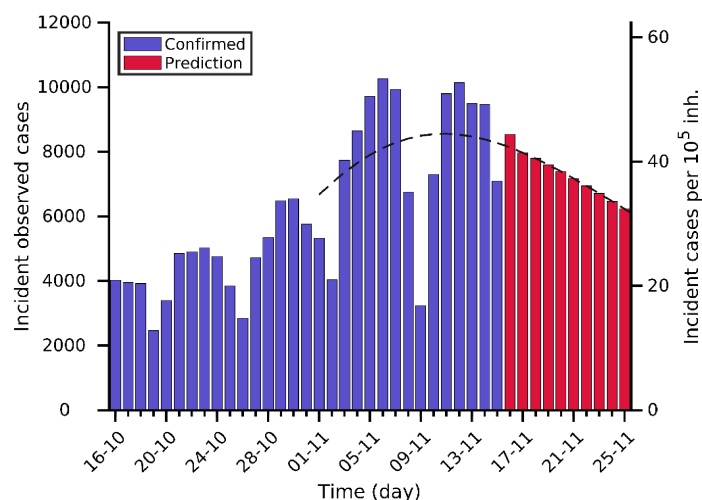


Predictions for next days

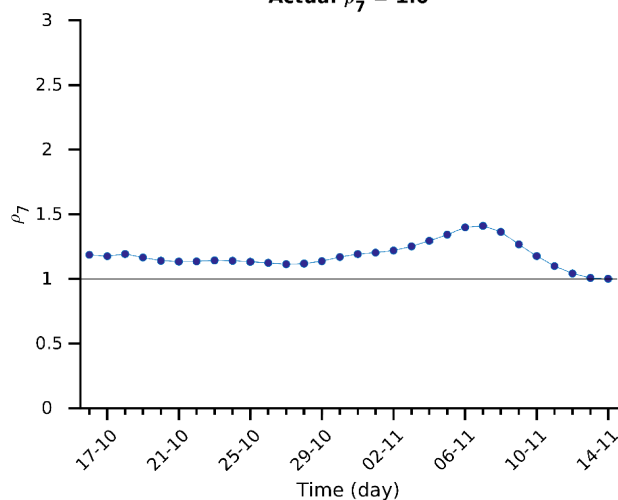
Day	Number of cases	95% Confidence Interval
18-11-2020	384588 (+24307)	[371695 - 397481]
22-11-2020	413694 (+53413)	[390887 - 436500]
25-11-2020	433107 (+72826)	[396448 - 469767]

Current indicators

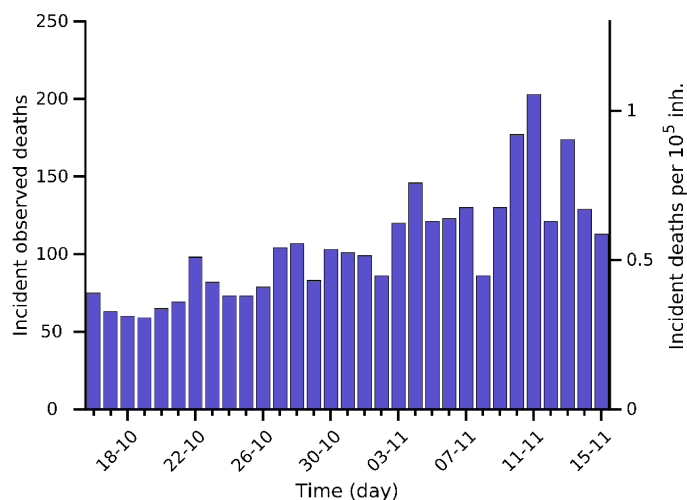
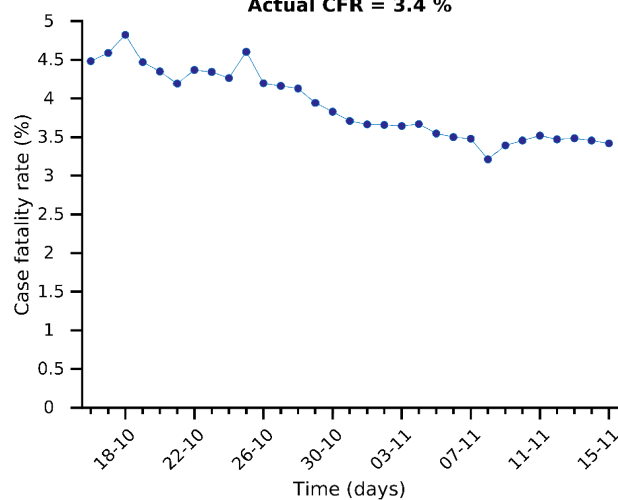
	A14	EPG	CFR	N7	D7
Today	591	591	3.42 %	8076	150
A Week ago	489	690	3.21 %	8155	116
Maximum	591	690	4.96 %	8205	150



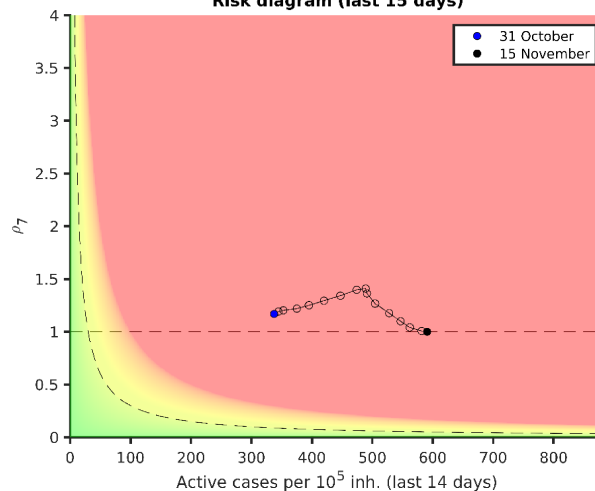
Actual $\rho_7 = 1.0$



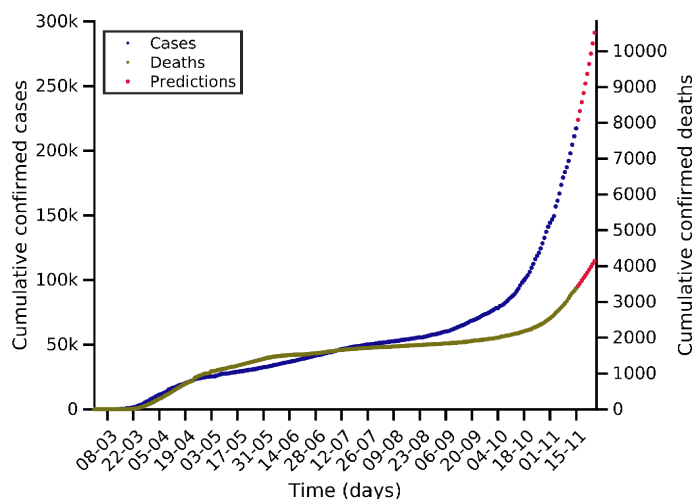
Actual CFR = 3.4 %



Risk diagram (last 15 days)



Portugal 15-11-2020. Pop: 10.2M. Cumulative incidence: 2131/10⁵

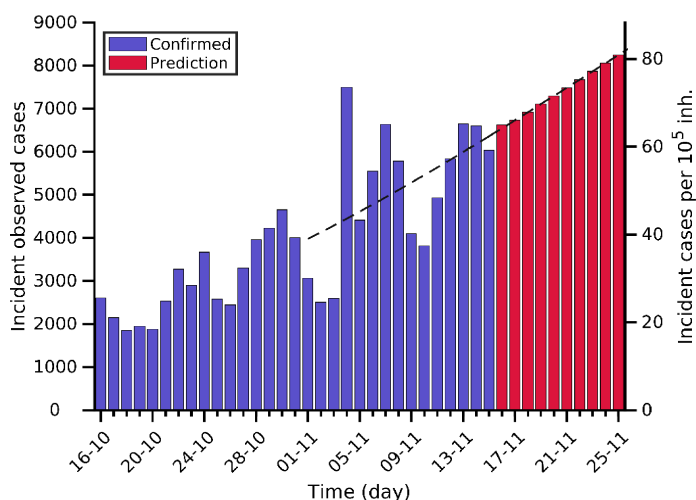


Predictions for next days

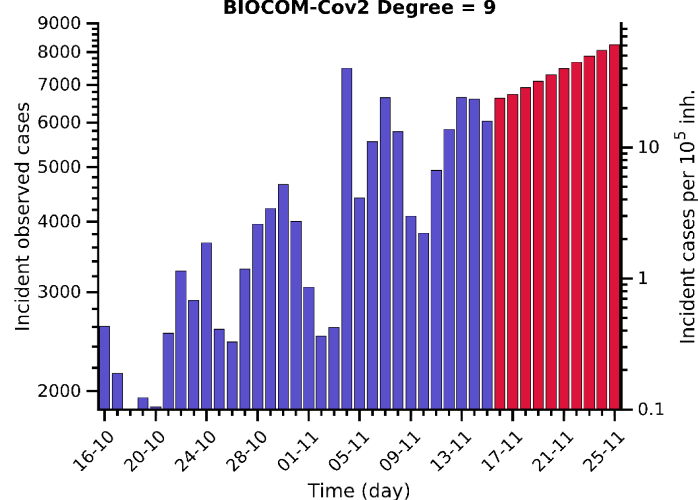
Day	Number of cases	95% Confidence Interval
18-11-2020	237579 (+20278)	[230859 - 244298]
22-11-2020	267144 (+49843)	[249597 - 284691]
25-11-2020	291318 (+74017)	[255429 - 327207]

Current indicators

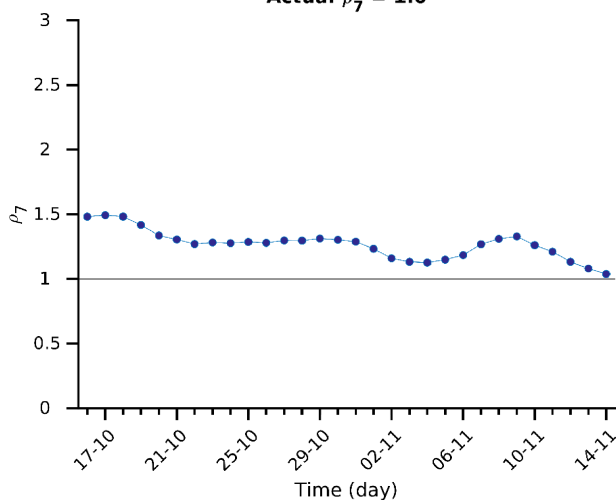
	A14	EPG	CFR	N7	D7
Today	716	742	2.61 %	5425	69
A Week ago	595	754	2.68 %	4998	50
Maximum	716	818	4.98 %	5425	69



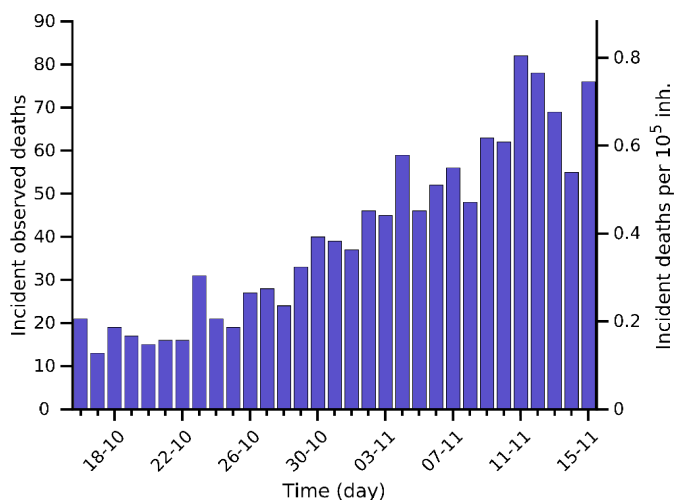
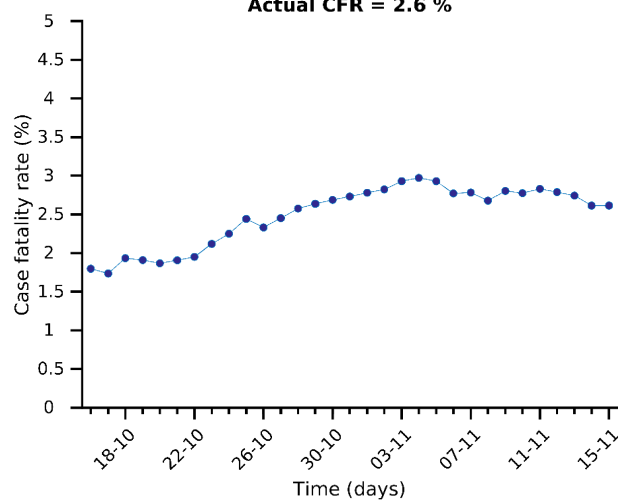
BIOCOM-Cov2 Degree = 9



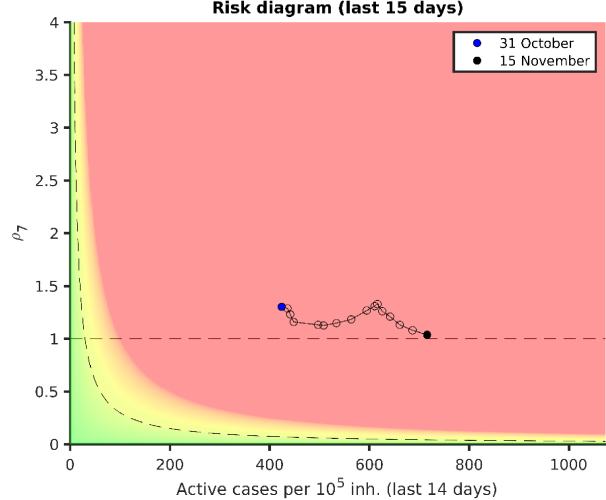
Actual $\rho_7 = 1.0$



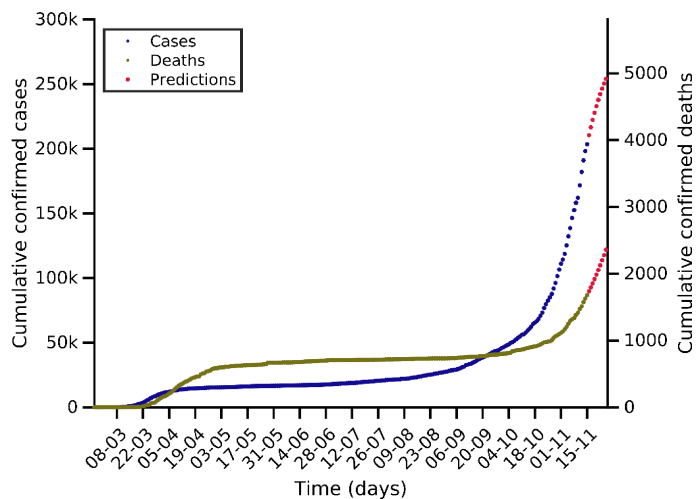
Actual CFR = 2.6 %



Risk diagram (last 15 days)



Austria 15-11-2020. Pop: 9.0M. Cumulative incidence: 2259/10⁵

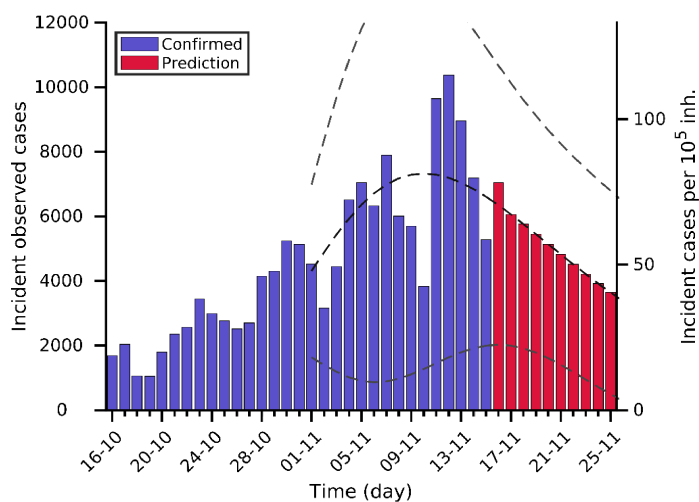


Predictions for next days

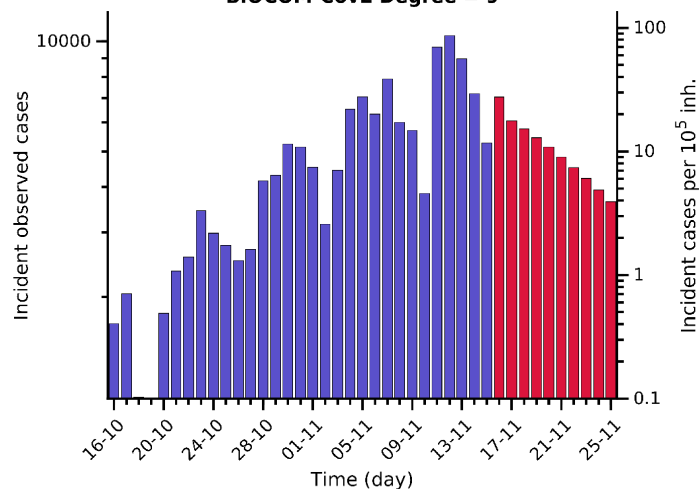
Day	Number of cases	95% Confidence Interval
18-11-2020	222365 (+18871)	[208105 - 236625]
22-11-2020	242292 (+38798)	[220552 - 264031]
25-11-2020	254070 (+50576)	[223084 - 285056]

Current indicators

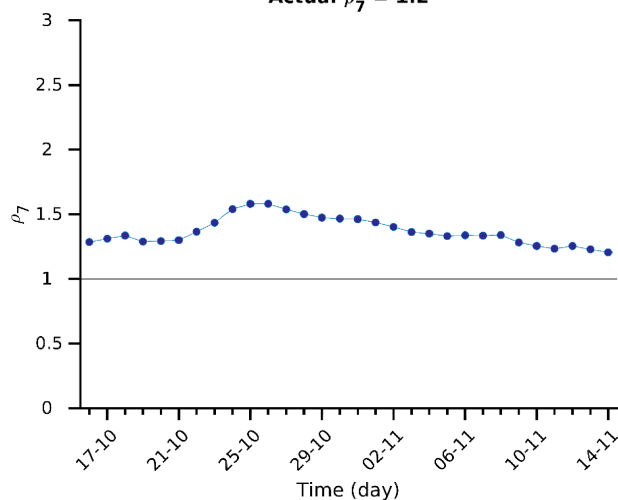
	A14	EPG	CFR	N7	D7
Today	1026	1237	2.13 %	7284	49
A Week ago	777	1037	2.07 %	5914	32
Maximum	1026	1250	4.93 %	7489	49



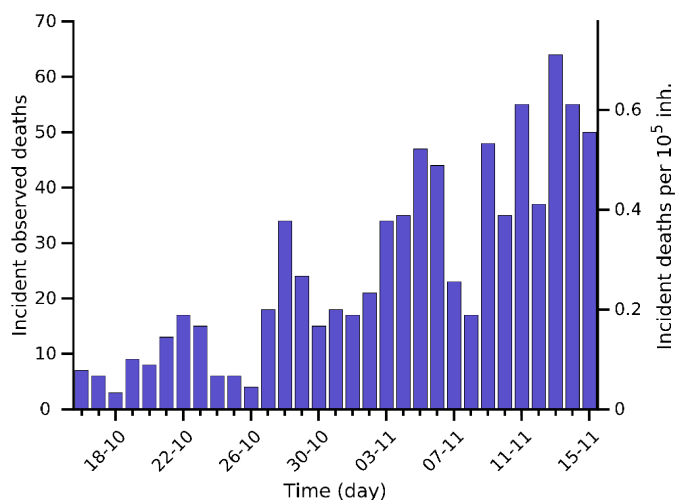
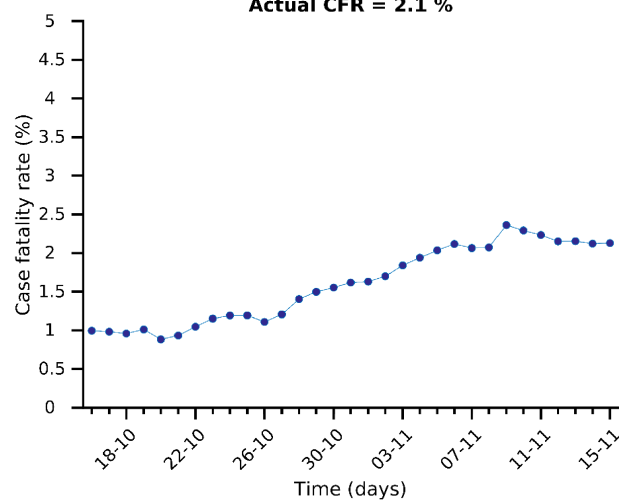
BIOCOM-Cov2 Degree = 9



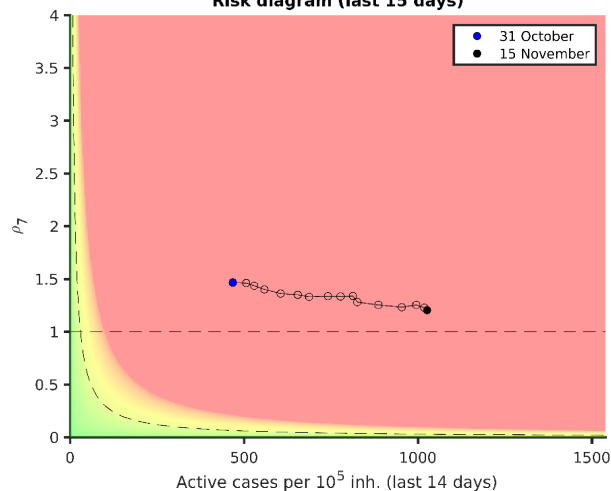
Actual $\rho_7 = 1.2$



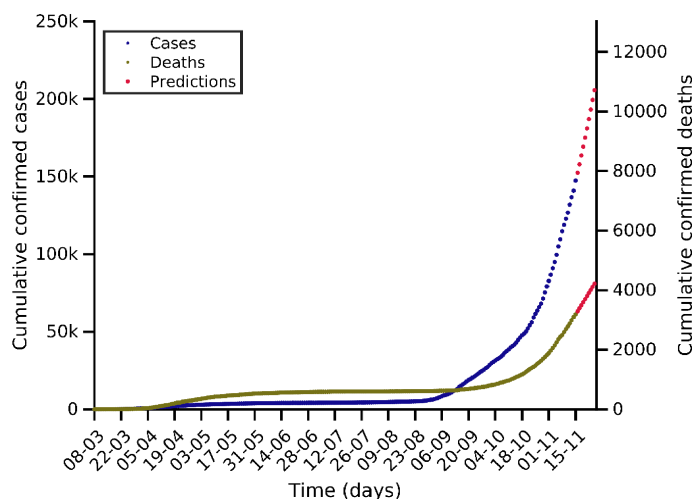
Actual CFR = 2.1 %



Risk diagram (last 15 days)



Hungary 15-11-2020. Pop: 9.7M. Cumulative incidence: 1526/10⁵

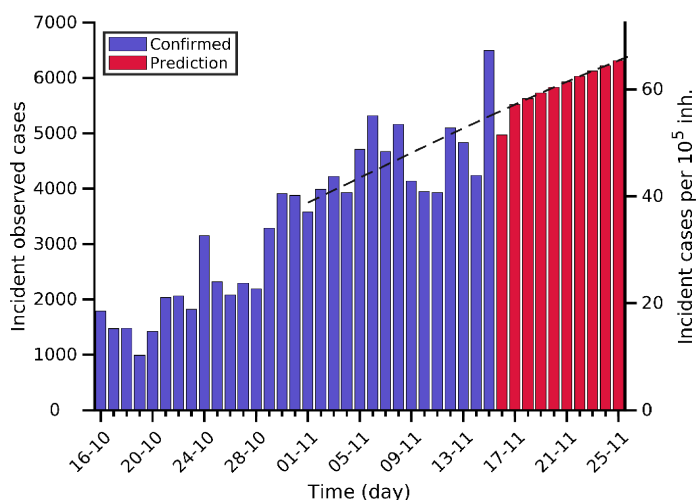


Predictions for next days

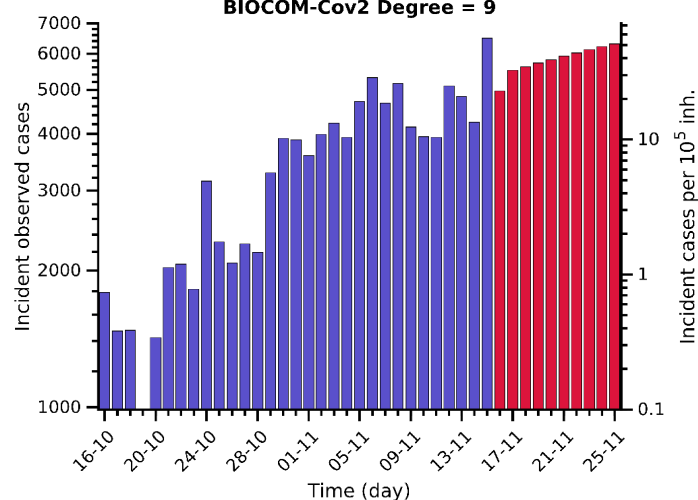
Day	Number of cases	95% Confidence Interval
18-11-2020	163569 (+16113)	[147456 - 291123]
22-11-2020	187086 (+39630)	[147456 - 319734]
25-11-2020	205748 (+58292)	[147456 - 324831]

Current indicators

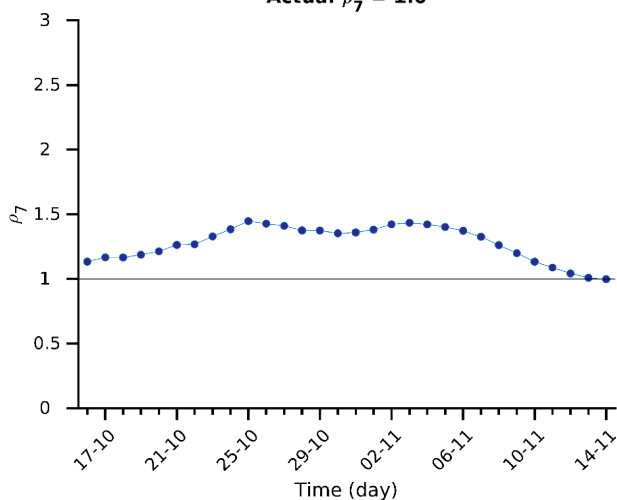
	A14	EPG	CFR	N7	D7
Today	669	668	5.66 %	4668	100
A Week ago	551	731	6.27 %	4571	86
Maximum	669	731	4.96 %	4668	100



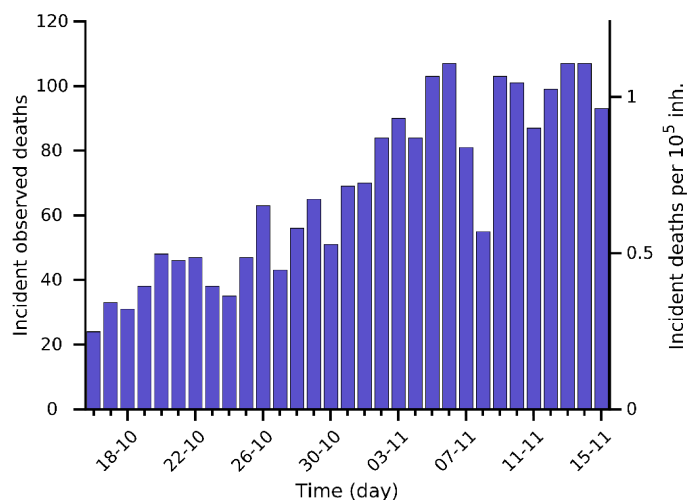
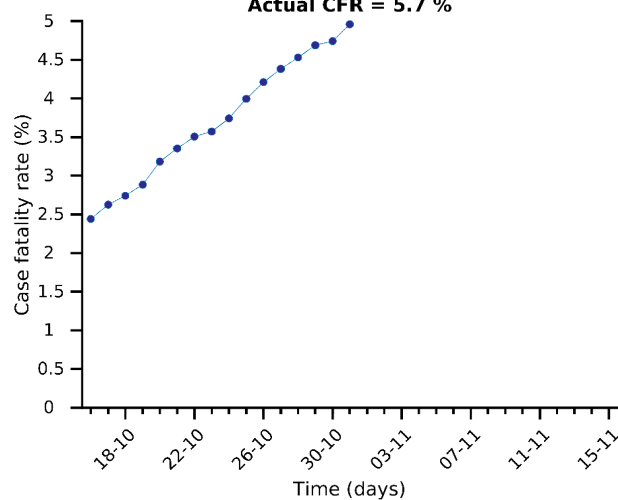
BIOCOM-Cov2 Degree = 9



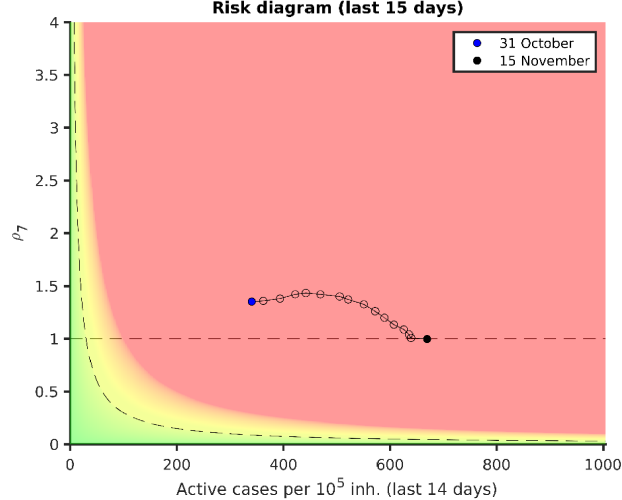
Actual $\rho_7 = 1.0$



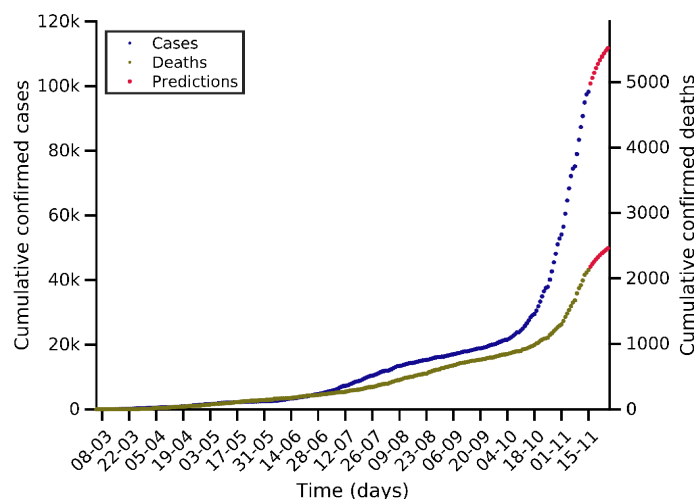
Actual CFR = 5.7 %



Risk diagram (last 15 days)



Bulgaria 15-11-2020. Pop: 6.9M. Cumulative incidence: 1414/10⁵

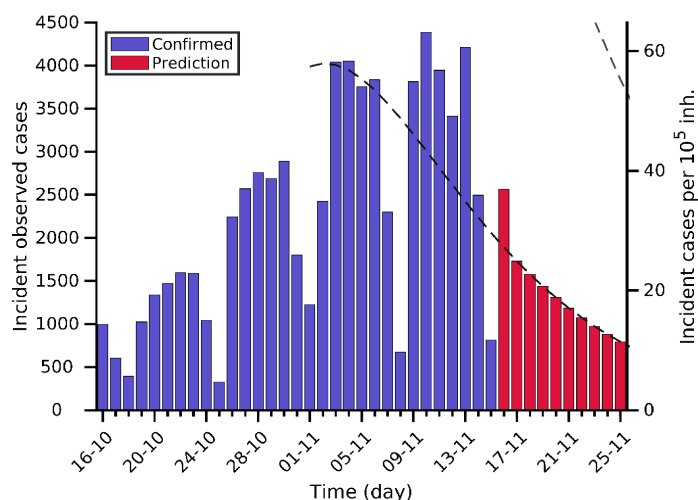


Predictions for next days

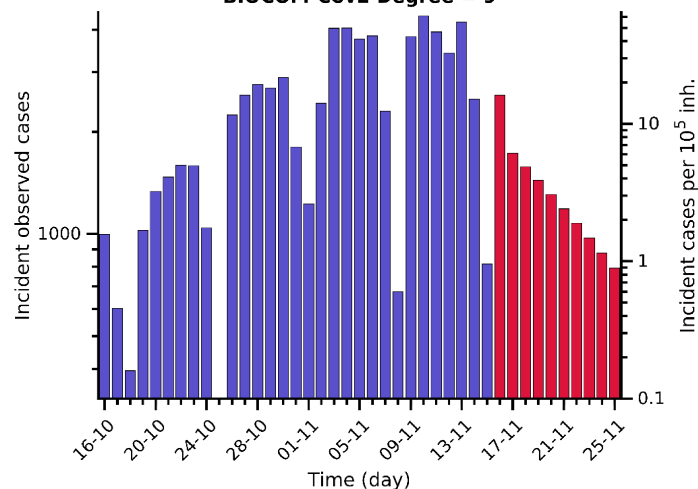
Day	Number of cases	95% Confidence Interval
18-11-2020	104125 (+5874)	[98251 - 116712]
22-11-2020	109131 (+10880)	[98251 - 125241]
25-11-2020	111777 (+13526)	[98251 - 131881]

Current indicators

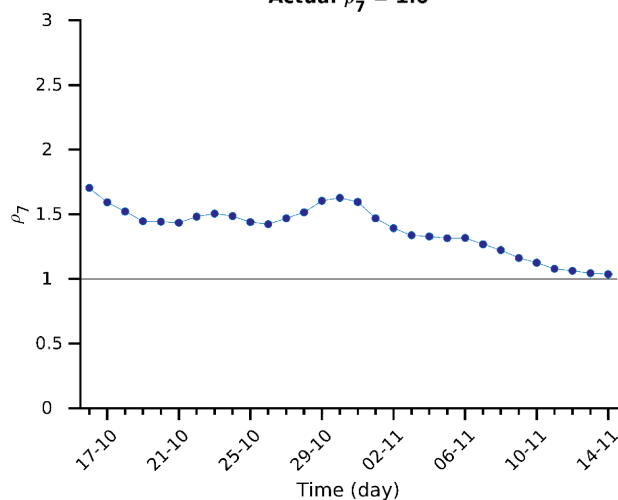
	A14	EPG	CFR	N7	D7
Today	636	659	6.17 %	3299	66
A Week ago	536	680	7.21 %	3013	52
Maximum	642	700	4.99 %	3299	68



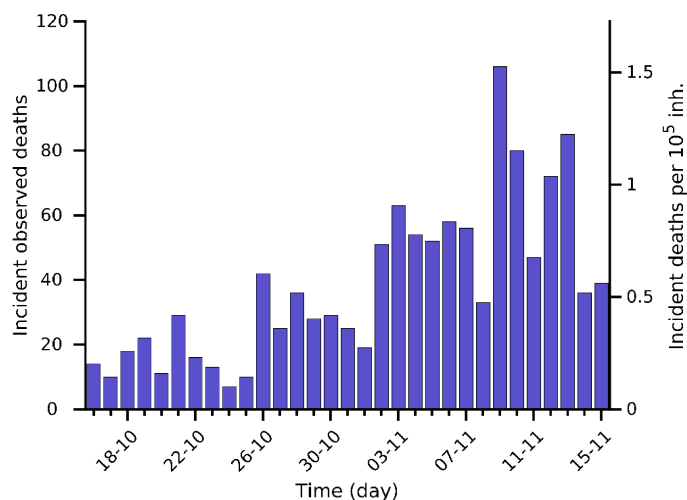
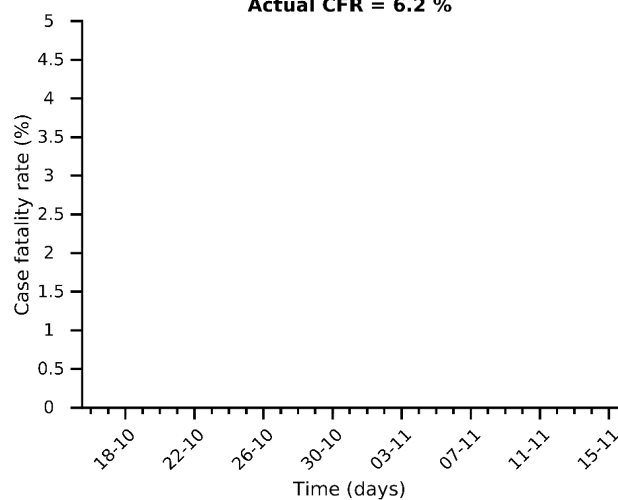
BIOCOM-Cov2 Degree = 9



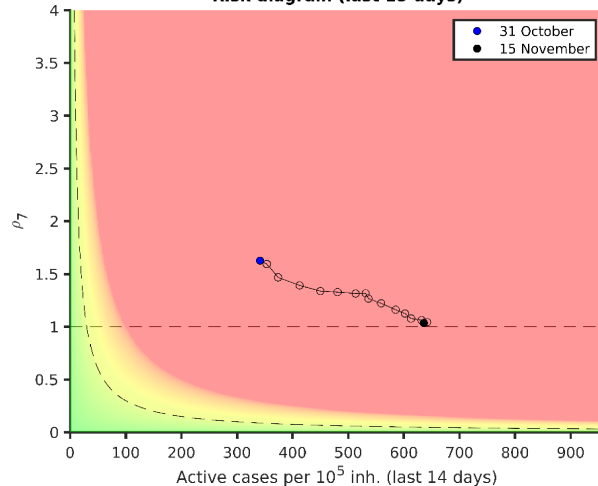
Actual $\rho_7 = 1.0$



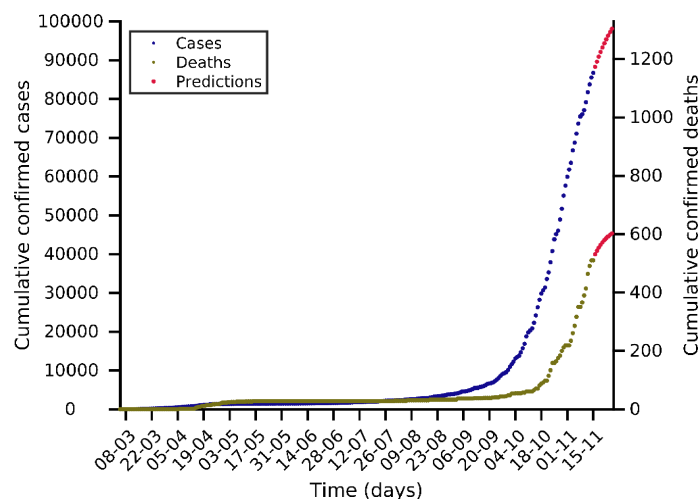
Actual CFR = 6.2 %



Risk diagram (last 15 days)



Slovakia 15-11-2020. Pop: 5.5M. Cumulative incidence: 1589/10⁵

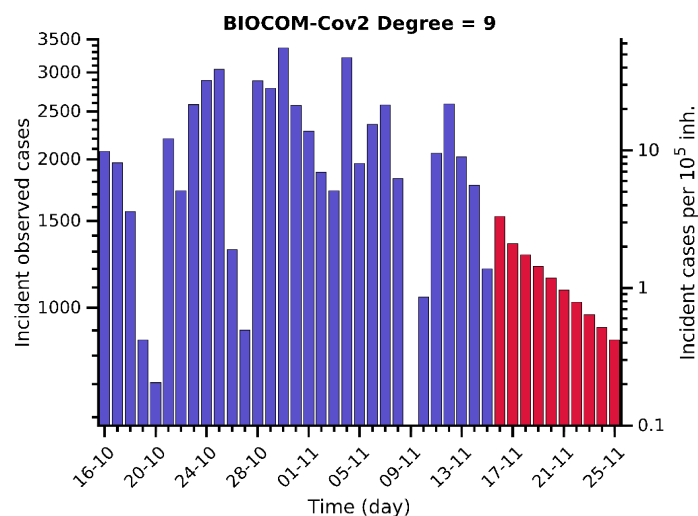
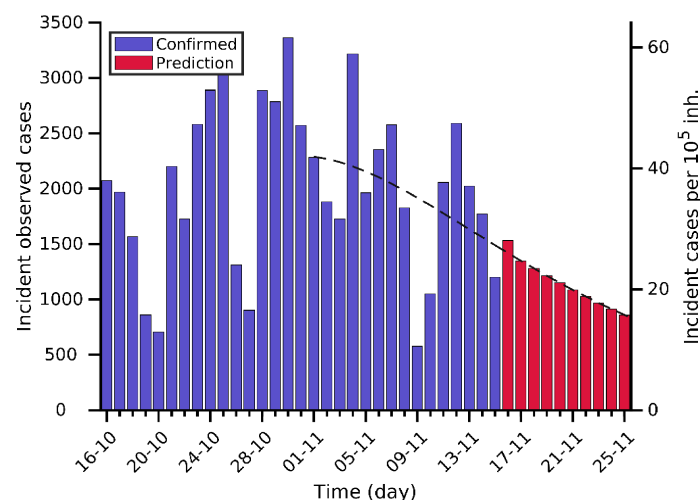


Predictions for next days

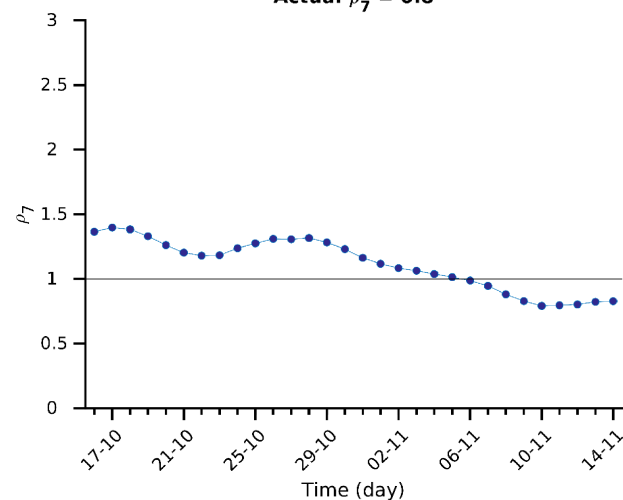
Day	Number of cases	95% Confidence Interval
18-11-2020	90928 (+4161)	[87660 - 94196]
22-11-2020	95404 (+8637)	[90472 - 100336]
25-11-2020	98145 (+11378)	[91000 - 105291]

Current indicators

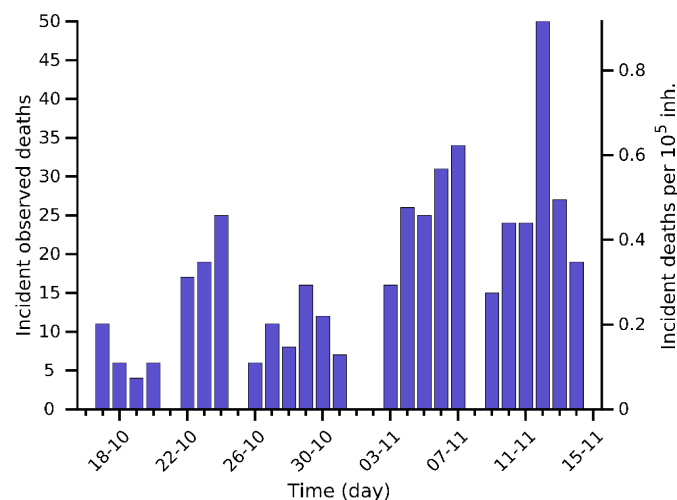
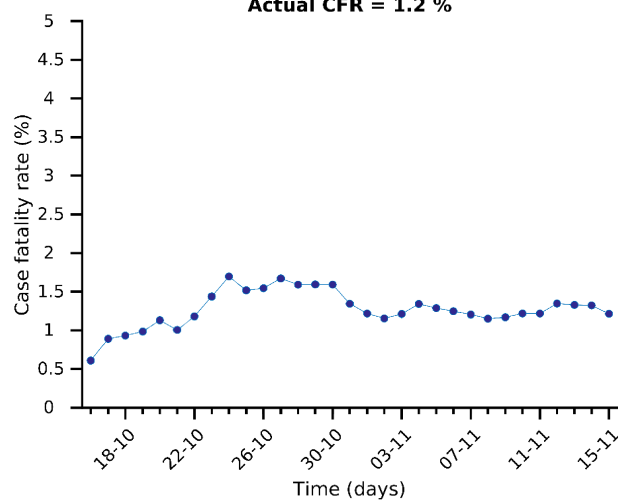
	A14	EPG	CFR	N7	D7
Today	491	407	1.21 %	1610	23
A Week ago	580	548	1.15 %	2221	19
Maximum	612	676	4.79 %	2547	25



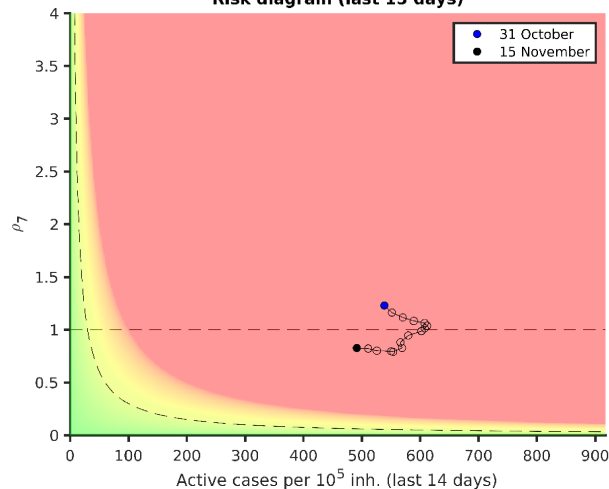
Actual $\rho_7 = 0.8$



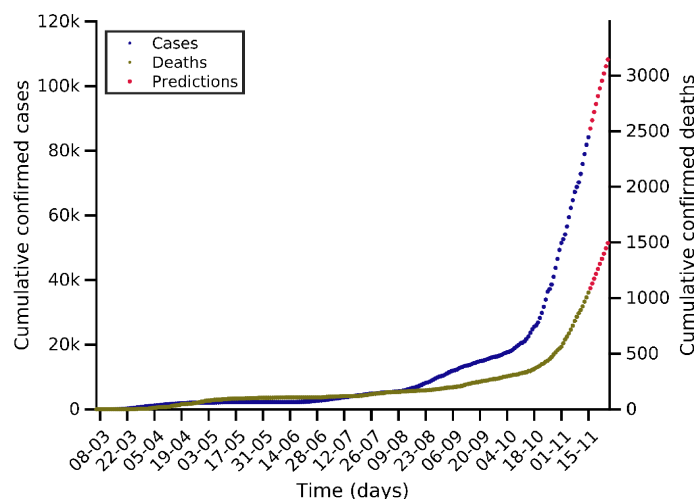
Actual CFR = 1.2 %



Risk diagram (last 15 days)



Croatia 15-11-2020. Pop: 4.1M. Cumulative incidence: 2051/10⁵

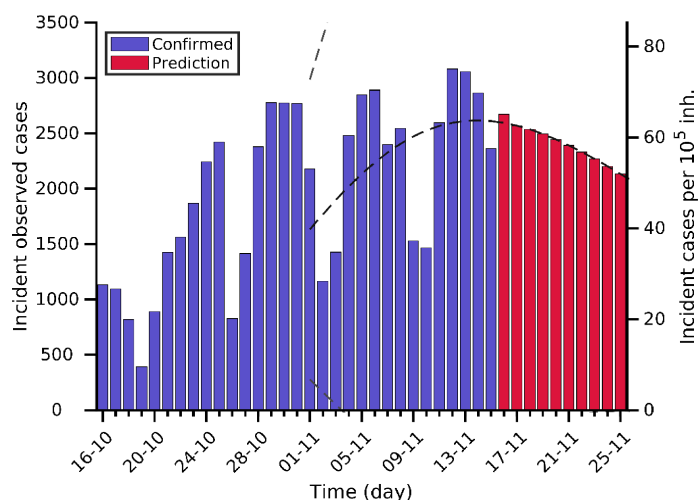


Predictions for next days

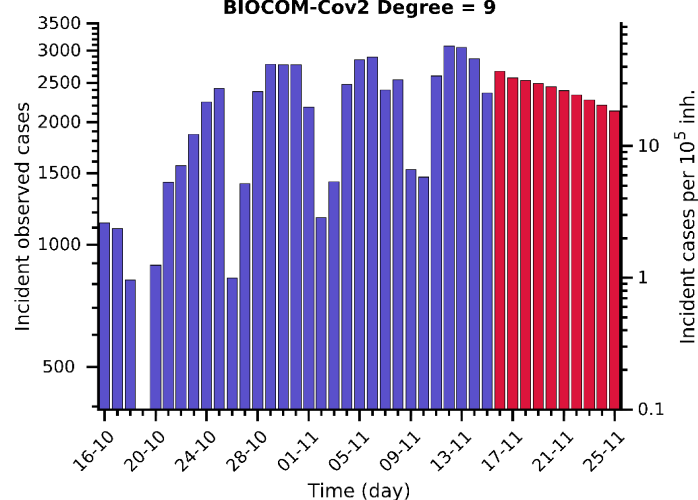
Day	Number of cases	95% Confidence Interval
18-11-2020	91981 (+7775)	[88687 - 95275]
22-11-2020	101644 (+17438)	[95459 - 107828]
25-11-2020	108248 (+24042)	[97988 - 118508]

Current indicators

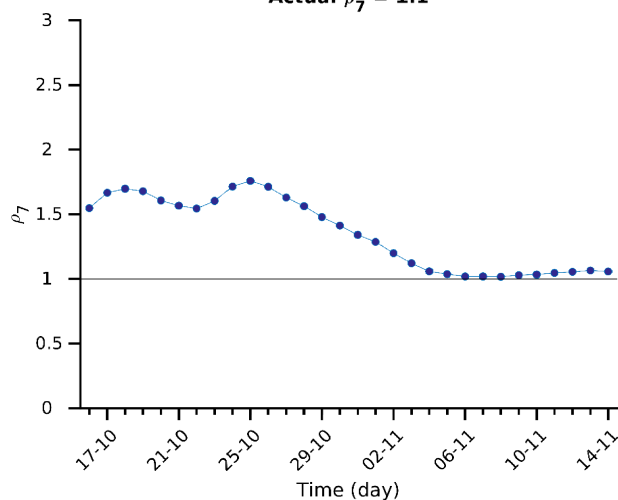
	A14	EPG	CFR	N7	D7
Today	797	842	3.06 %	2423	36
A Week ago	752	766	4.51 %	2250	33
Maximum	797	846	4.90 %	2449	36



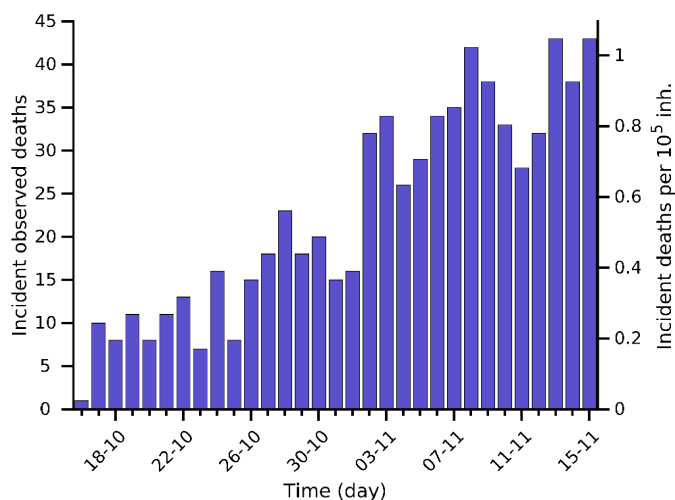
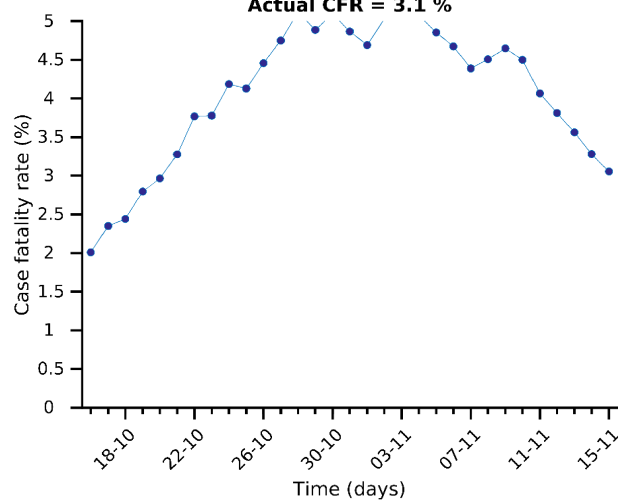
BIOCOM-Cov2 Degree = 9



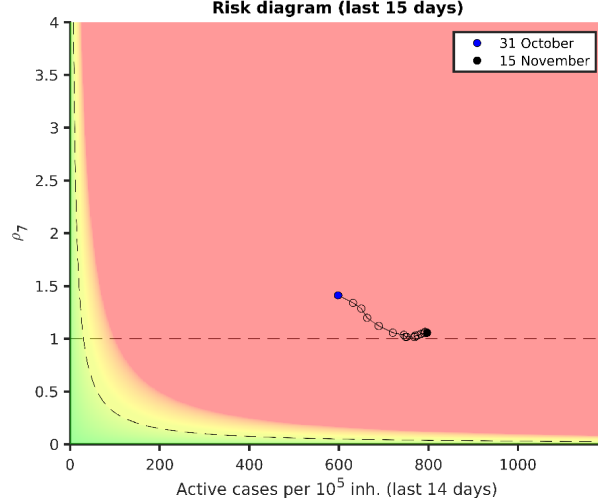
Actual $\rho_7 = 1.1$



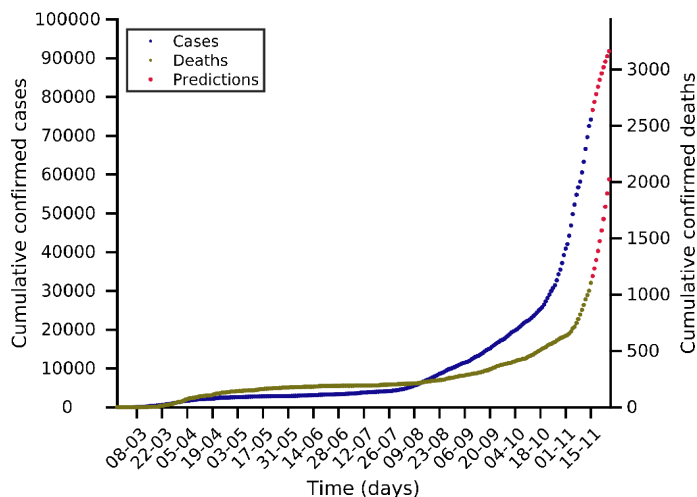
Actual CFR = 3.1 %



Risk diagram (last 15 days)



Greece 15-11-2020. Pop: 10.4M. Cumulative incidence: 712/10⁵

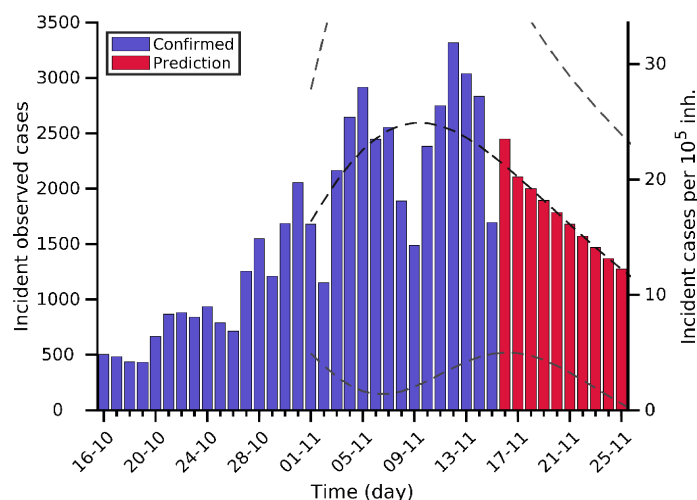


Predictions for next days

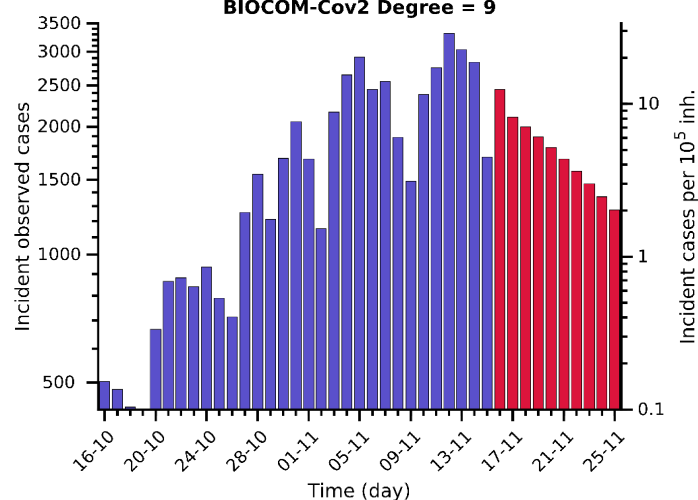
Day	Number of cases	95% Confidence Interval
18-11-2020	80760 (+6555)	[75551 - 85968]
22-11-2020	87688 (+13483)	[79786 - 95590]
25-11-2020	91799 (+17594)	[80540 - 103058]

Current indicators

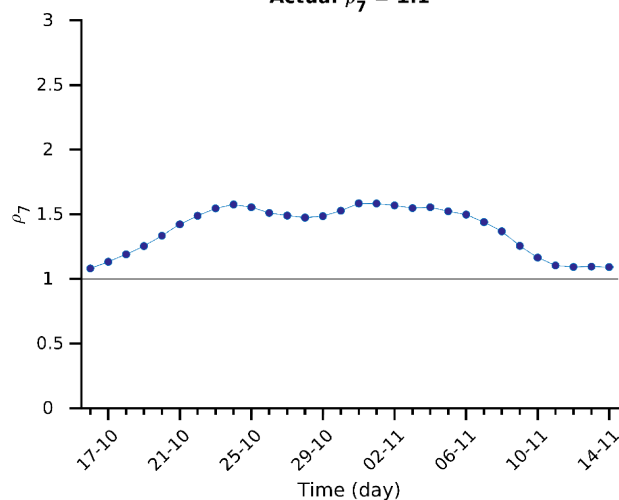
	A14	EPG	CFR	N7	D7
Today	319	349	5.59 %	2501	46
A Week ago	249	358	3.80 %	2253	21
Maximum	319	358	4.95 %	2529	46



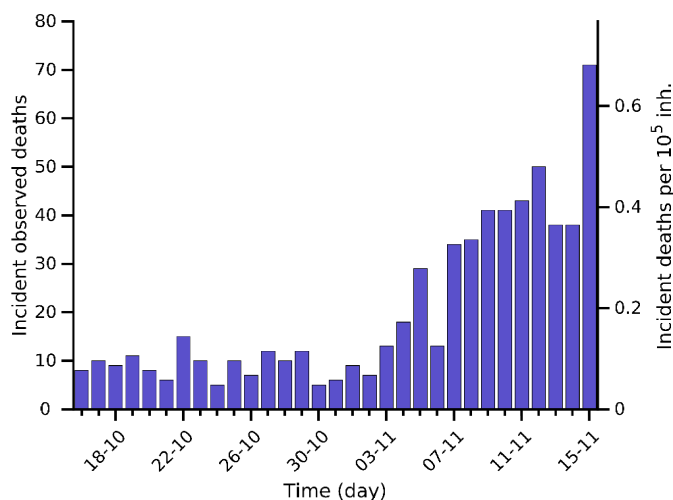
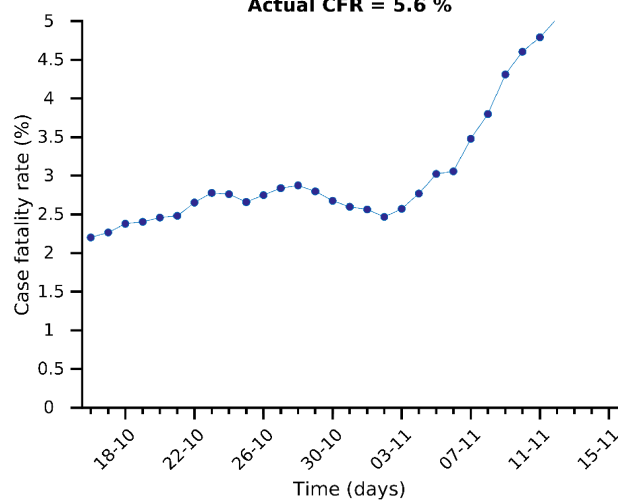
BIOCOM-Cov2 Degree = 9



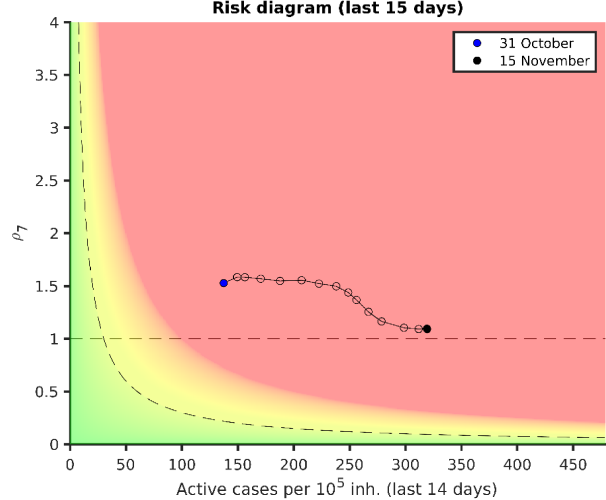
Actual $\rho_7 = 1.1$



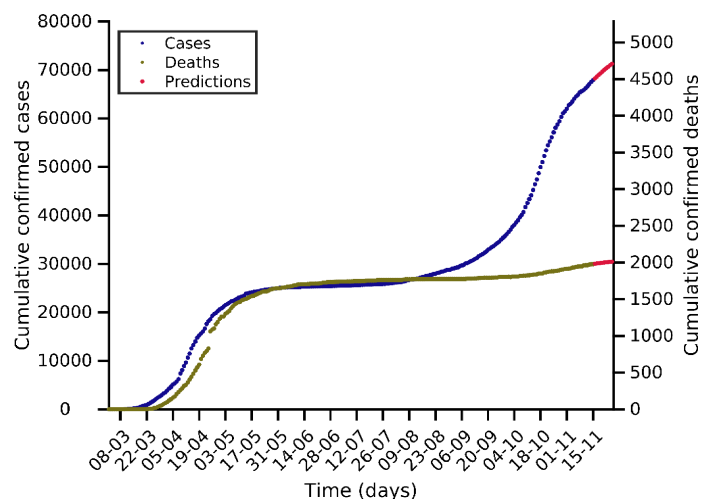
Actual CFR = 5.6 %



Risk diagram (last 15 days)



Ireland 15-11-2020. Pop: 4.9M. Cumulative incidence: 1375/10⁵

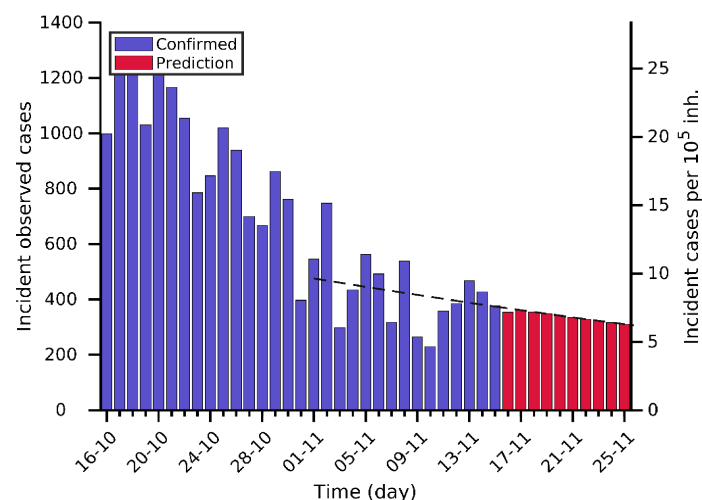


Predictions for next days

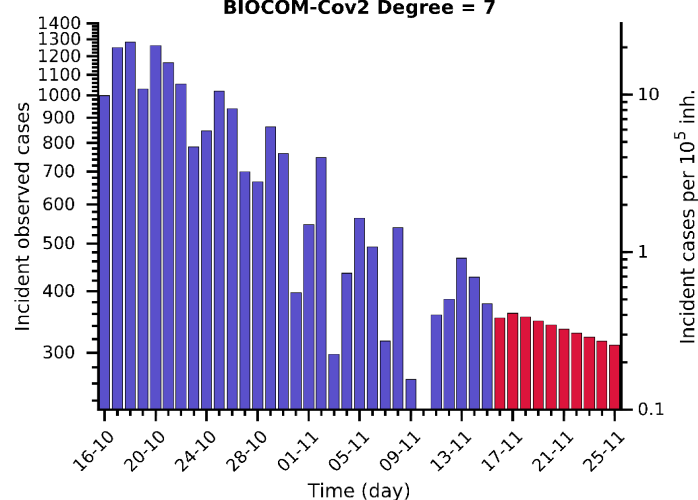
Day	Number of cases	95% Confidence Interval
18-11-2020	68972 (+1069)	[67941 - 70003]
22-11-2020	70325 (+2422)	[68765 - 71886]
25-11-2020	71275 (+3372)	[69719 - 72831]

Current indicators

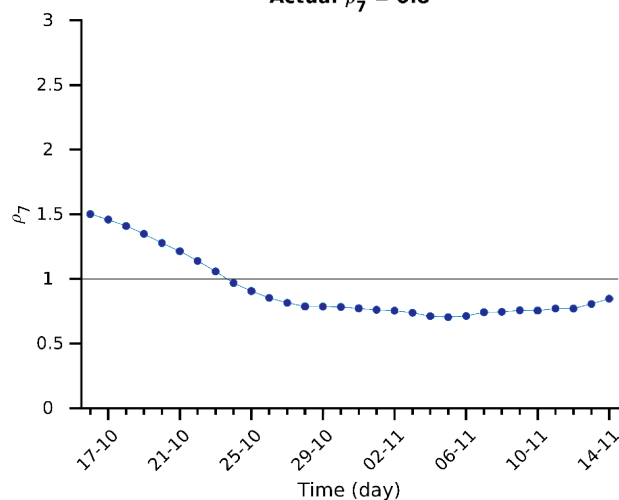
	A14	EPG	CFR	N7	D7
Today	120	101	0.44 %	358	5
A Week ago	167	124	0.54 %	485	5
Maximum	298	363	4.93 %	1168	70



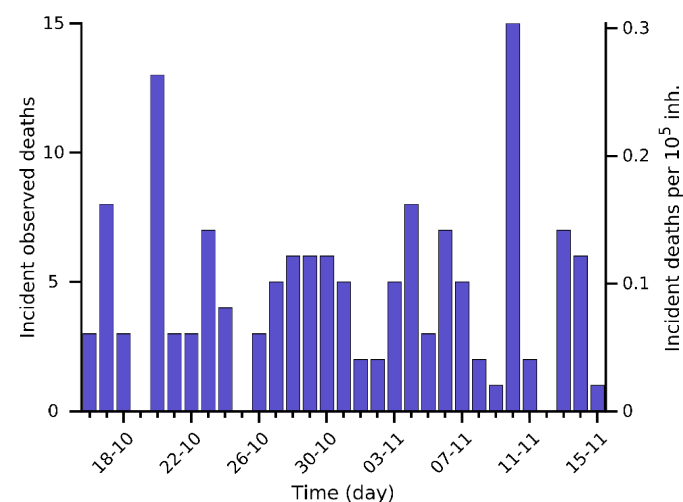
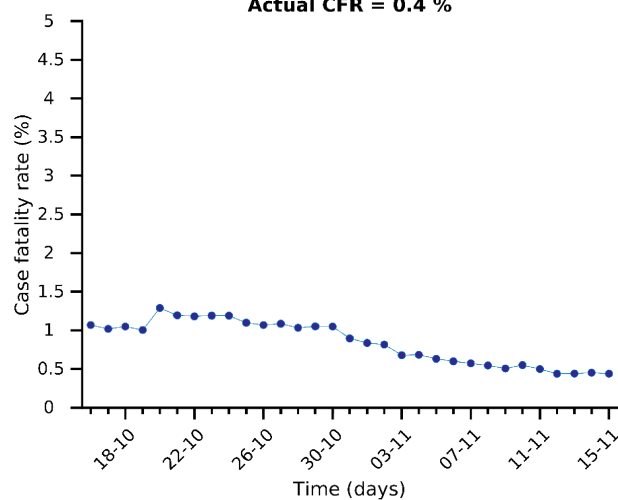
BIOCOM-Cov2 Degree = 7



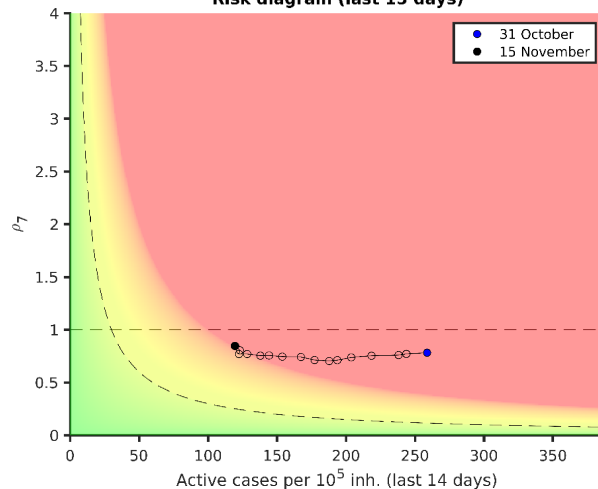
Actual $\rho_7 = 0.8$



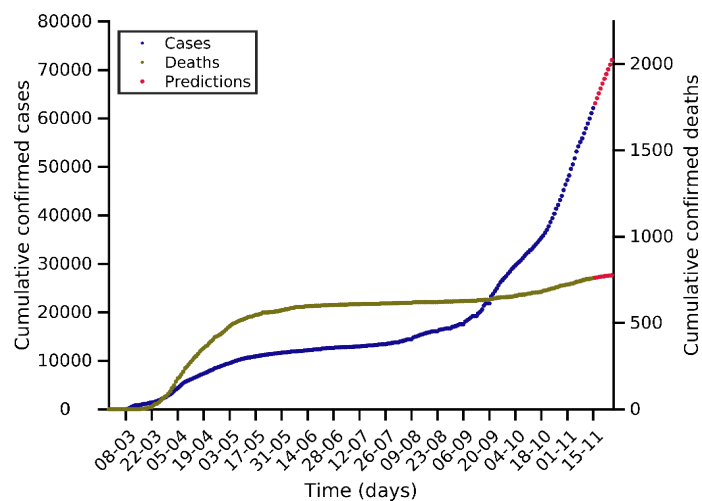
Actual CFR = 0.4 %



Risk diagram (last 15 days)



Denmark 15-11-2020. Pop: 5.8M. Cumulative incidence: 1073/10⁵

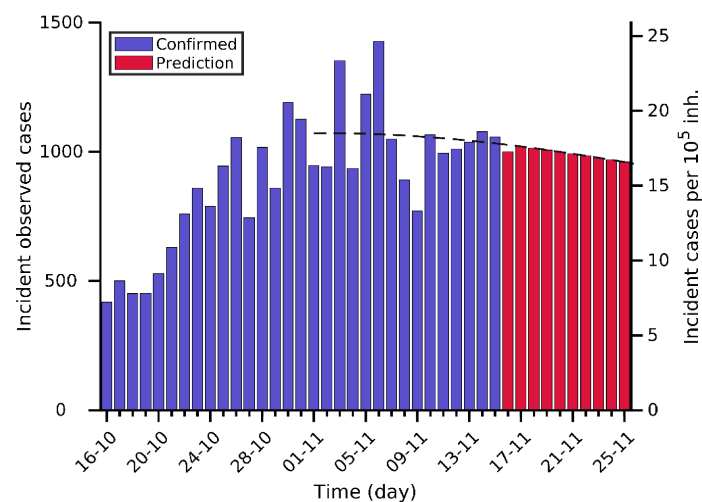


Predictions for next days

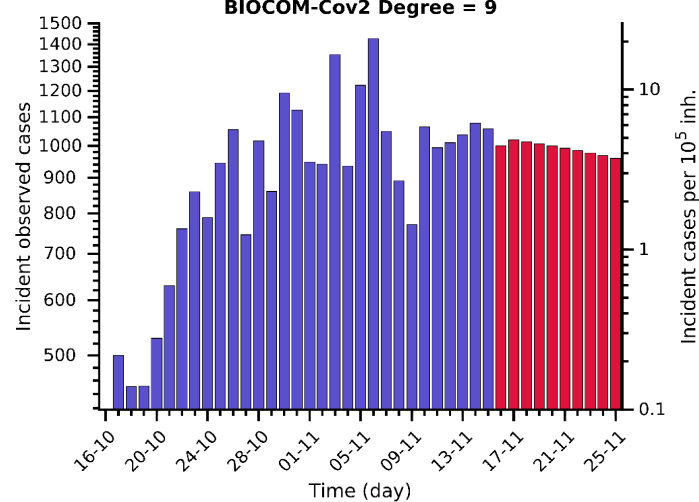
Day	Number of cases	95% Confidence Interval
18-11-2020	65171 (+3035)	[64262 - 66080]
22-11-2020	69155 (+7019)	[67973 - 70338]
25-11-2020	72061 (+9925)	[70434 - 73688]

Current indicators

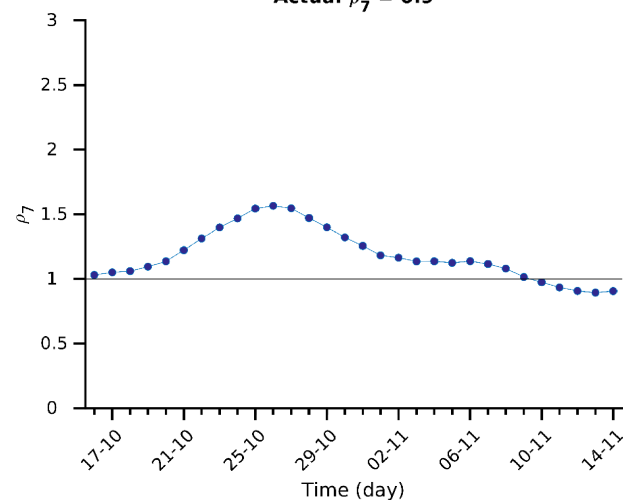
	A14	EPG	CFR	N7	D7
Today	256	232	0.47 %	1002	2
A Week ago	255	284	0.72 %	1117	3
Maximum	258	324	4.41 %	1136	16



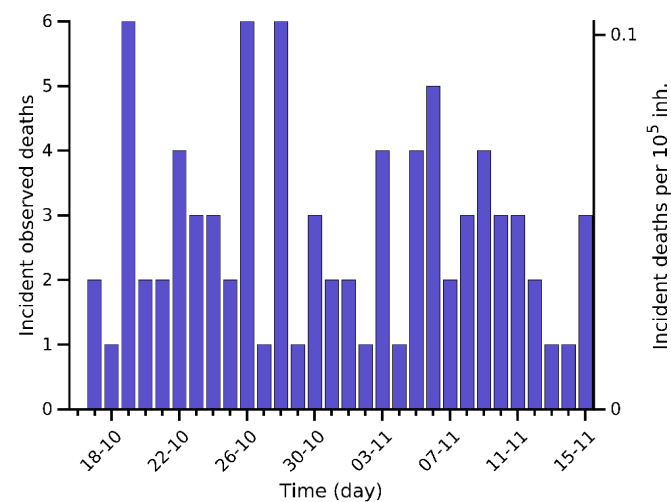
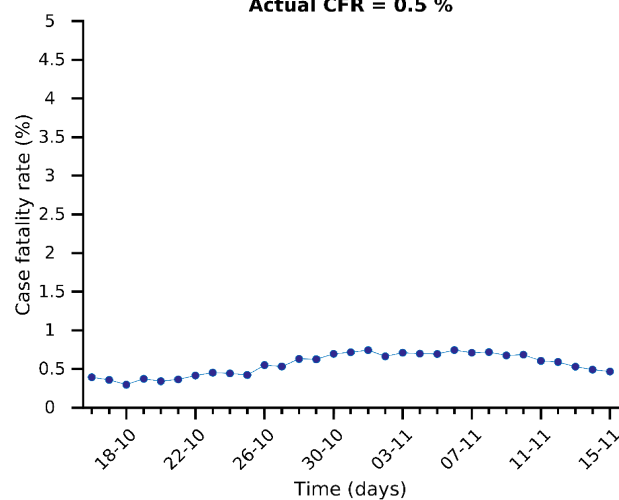
BIOCOM-Cov2 Degree = 9



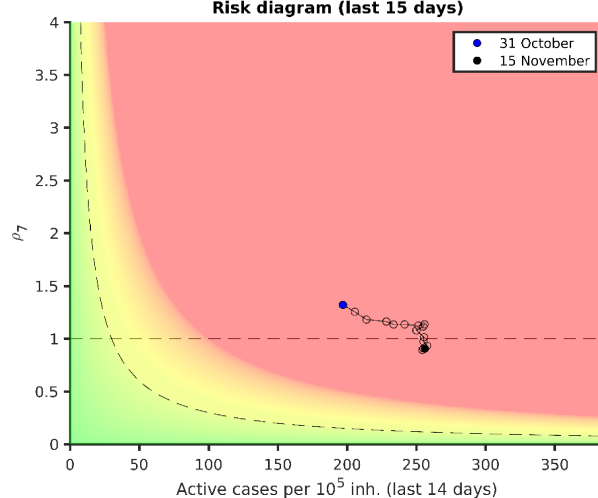
Actual $\rho_7 = 0.9$



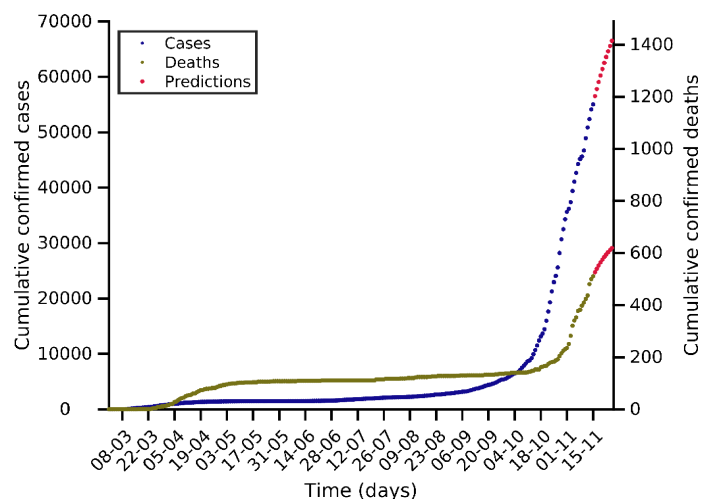
Actual CFR = 0.5 %



Risk diagram (last 15 days)



Slovenia 15-11-2020. Pop: 2.1M. Cumulative incidence: 2648/10⁵

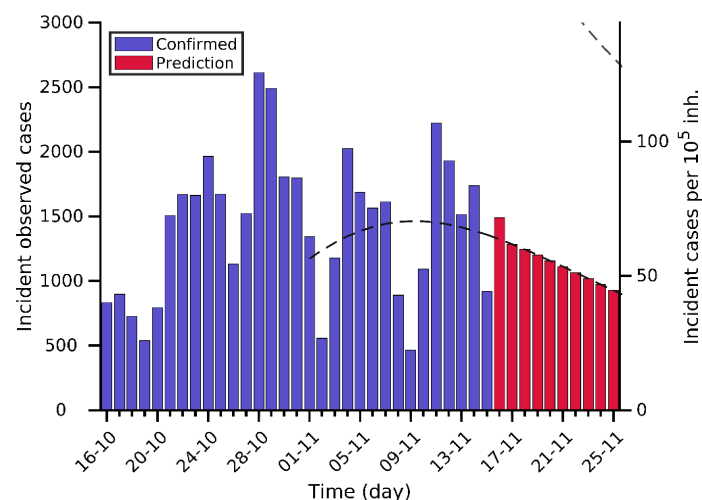


Predictions for next days

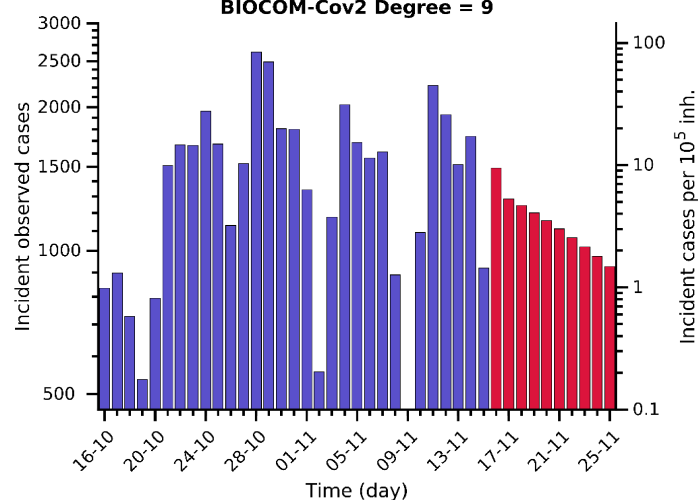
Day	Number of cases	95% Confidence Interval
18-11-2020	59061 (+4019)	[55113 - 63009]
22-11-2020	63595 (+8553)	[57003 - 70187]
25-11-2020	66513 (+11471)	[56338 - 76689]

Current indicators

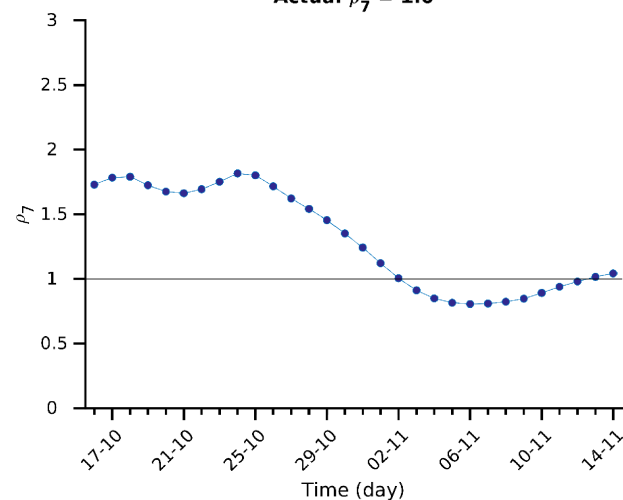
	A14	EPG	CFR	N7	D7
Today	933	972	1.93 %	1412	18
A Week ago	1068	865	2.99 %	1359	21
Maximum	1128	1484	4.97 %	1885	21



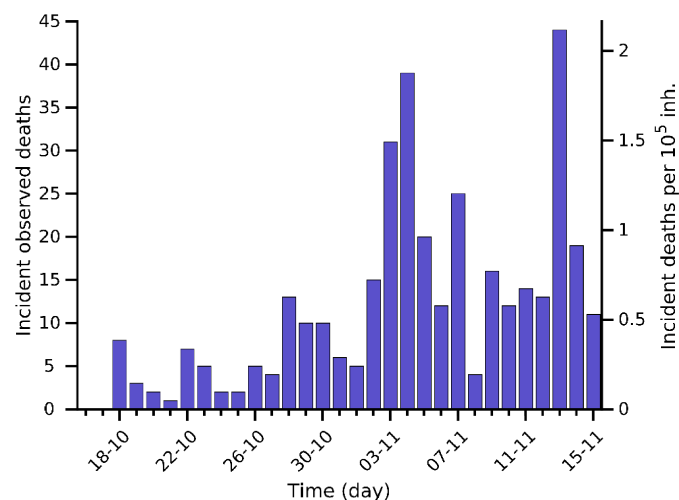
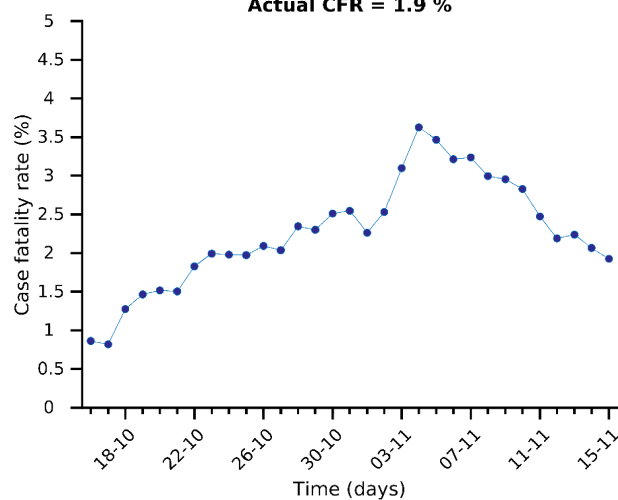
BIOCOM-Cov2 Degree = 9



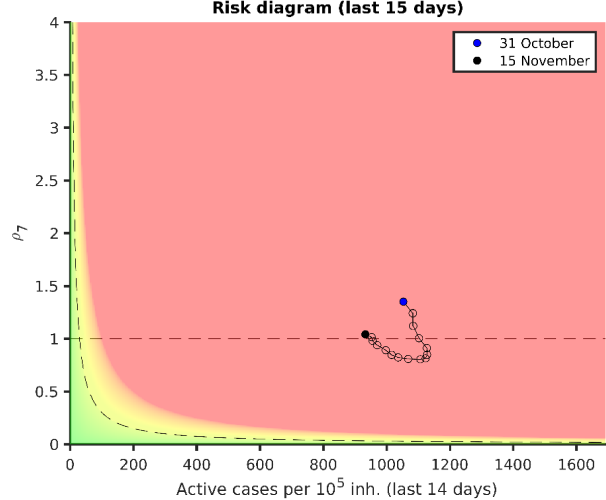
Actual $\rho_7 = 1.0$



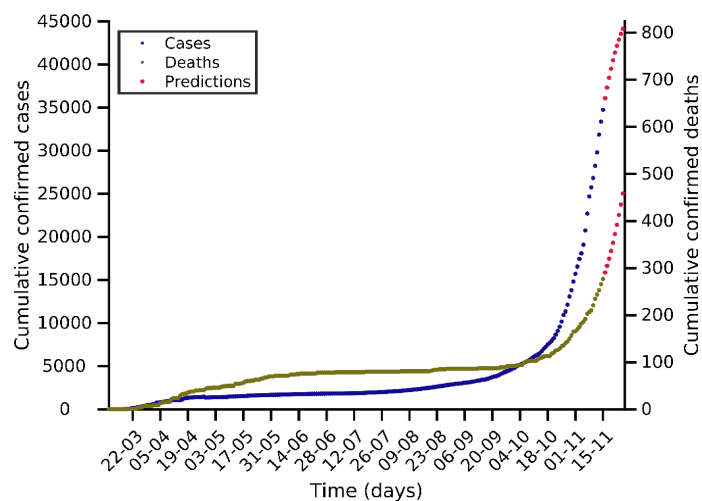
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Lithuania 15-11-2020. Pop: 2.7M. Cumulative incidence: 1277/10⁵

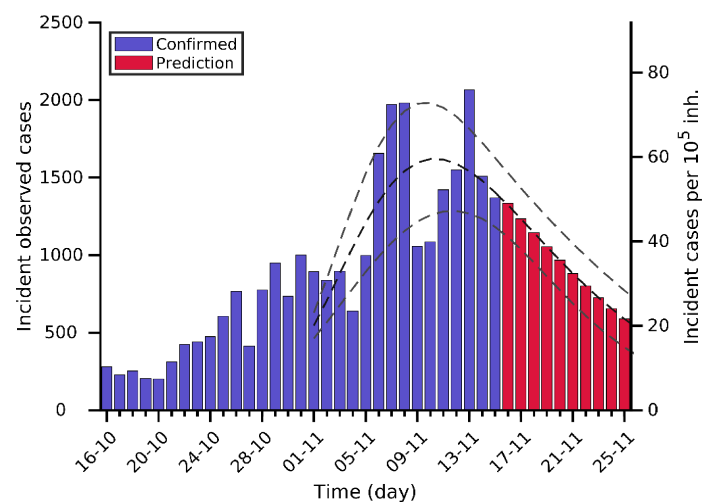


Predictions for next days

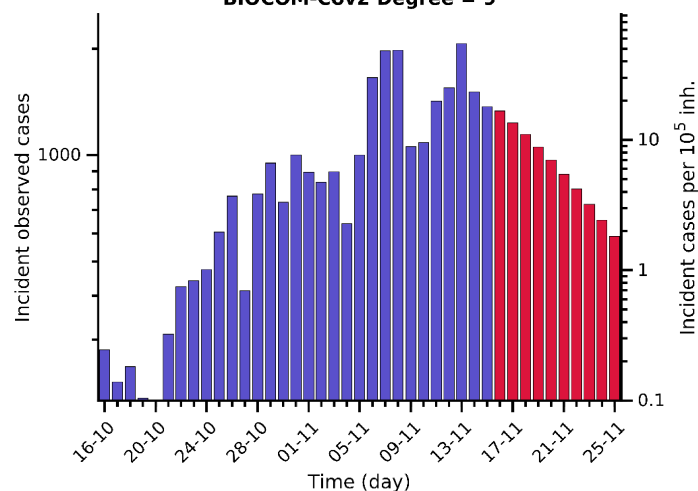
Day	Number of cases	95% Confidence Interval
18-11-2020	38470 (+3712)	[37167 - 39774]
22-11-2020	42176 (+7418)	[40352 - 44000]
25-11-2020	44145 (+9387)	[41746 - 46543]

Current indicators

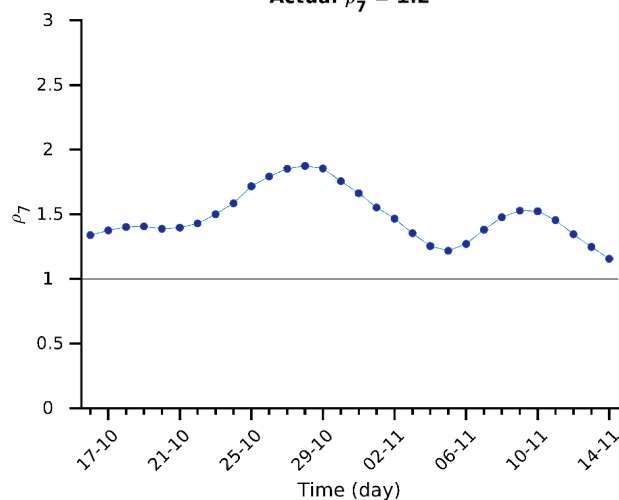
	A14	EPG	CFR	N7	D7
Today	699	808	2.73 %	1437	10
A Week ago	533	736	3.12 %	1283	6
Maximum	699	902	4.93 %	1590	10



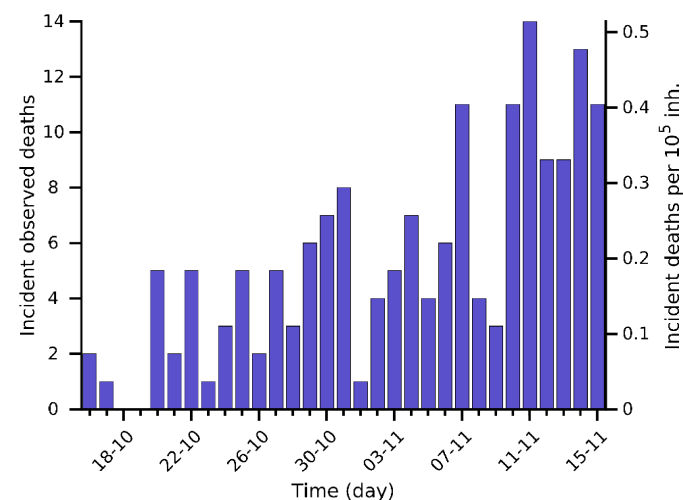
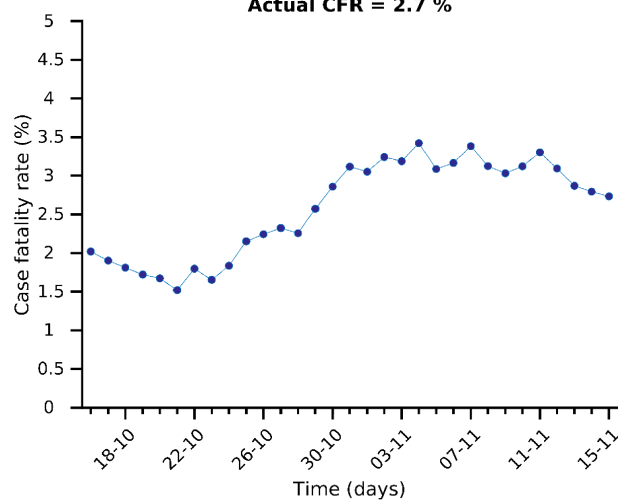
BIOCOM-Cov2 Degree = 9



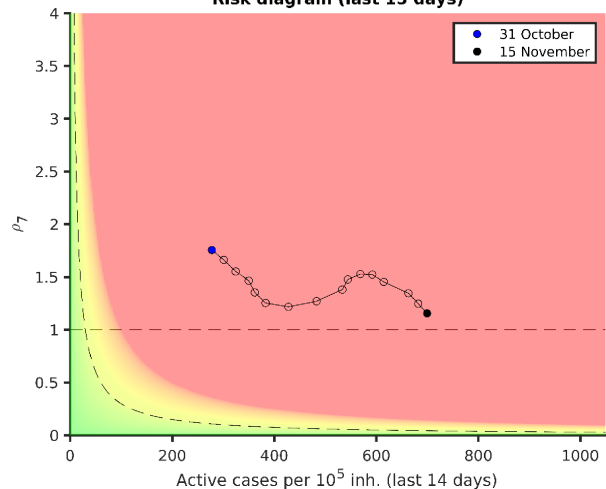
Actual $\rho_7 = 1.2$



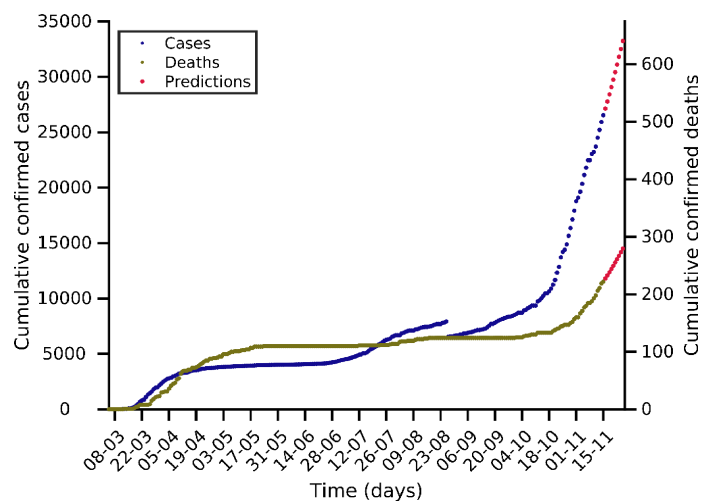
Actual CFR = 2.7 %



Risk diagram (last 15 days)



Luxembourg 15-11-2020. Pop: 0.6M. Cumulative incidence: 4240/10⁵

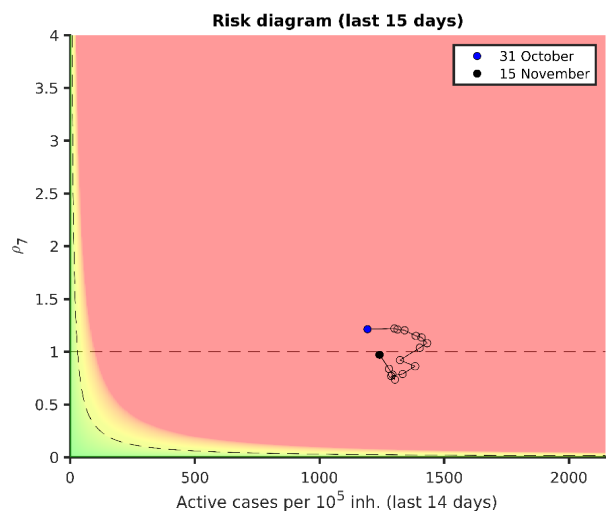
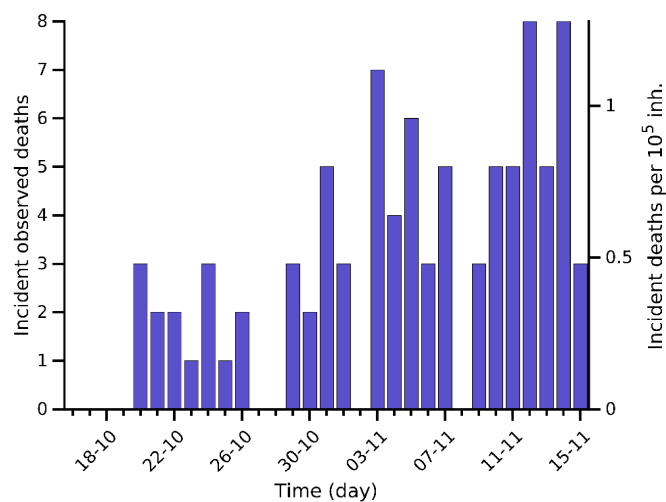
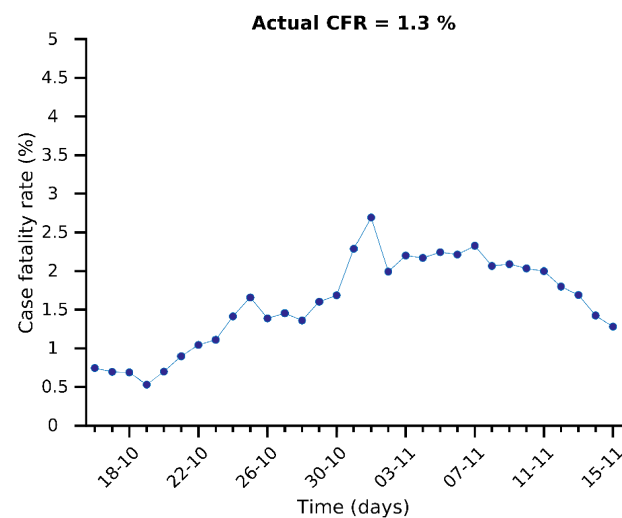
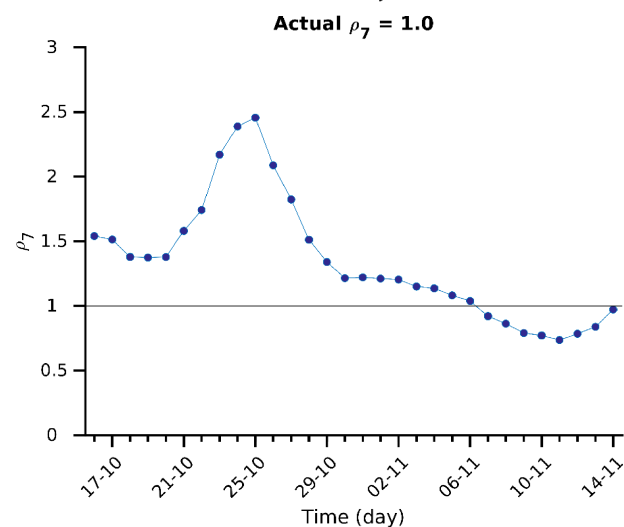
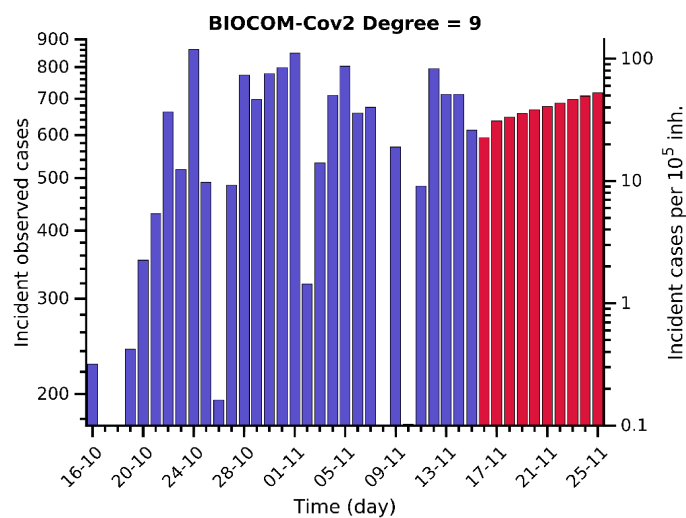
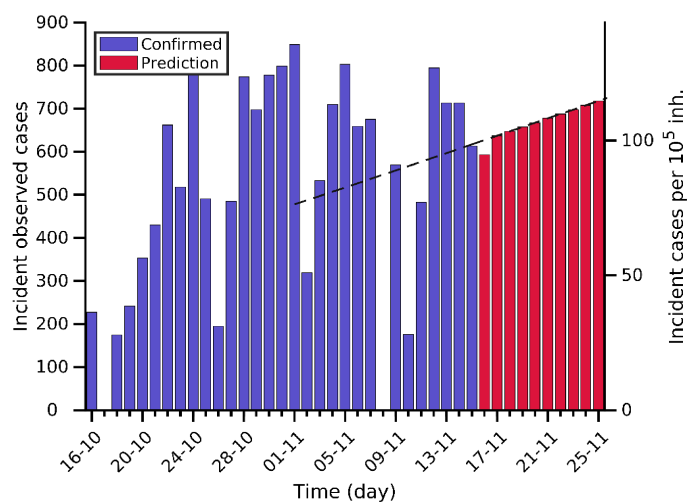


Predictions for next days

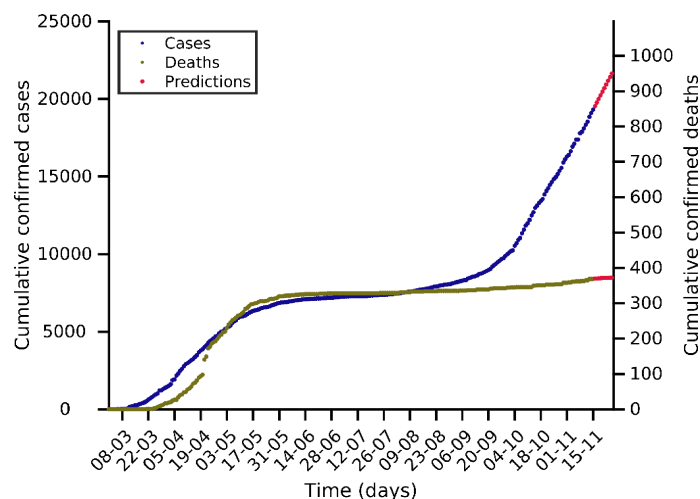
Day	Number of cases	95% Confidence Interval
18-11-2020	28422 (+1878)	[26990 - 29854]
22-11-2020	31112 (+4568)	[27620 - 34605]
25-11-2020	33236 (+6692)	[26544 - 40168]

Current indicators

	A14	EPG	CFR	N7	D7
Today	1240	1205	1.28 %	580	5
A Week ago	1322	1218	2.07 %	528	4
Maximum	1431	1848	4.03 %	684	5



Finland 15-11-2020. Pop: 5.5M. Cumulative incidence: 349/10⁵

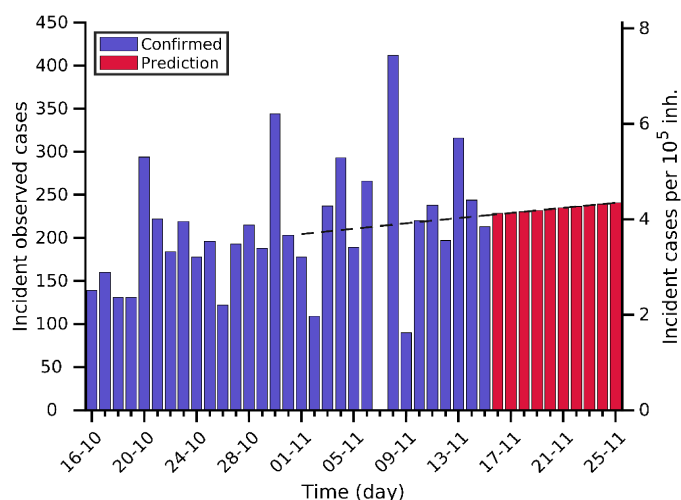


Predictions for next days

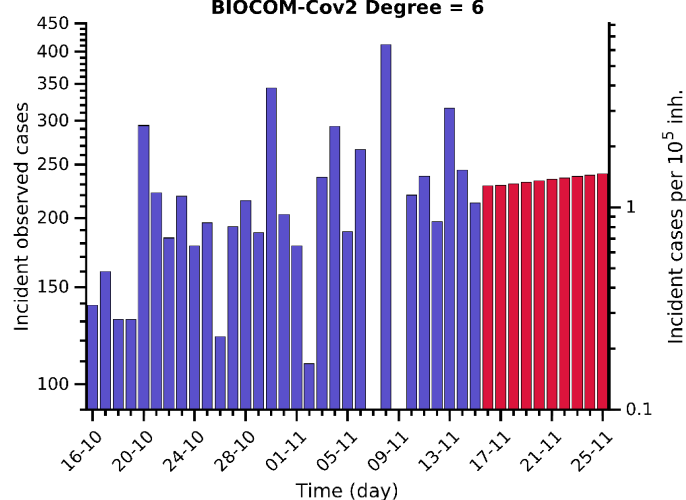
Day	Number of cases	95% Confidence Interval
18-11-2020	20003 (+688)	[19673 - 20333]
22-11-2020	20940 (+1625)	[20171 - 21708]
25-11-2020	21658 (+2343)	[20167 - 23148]

Current indicators

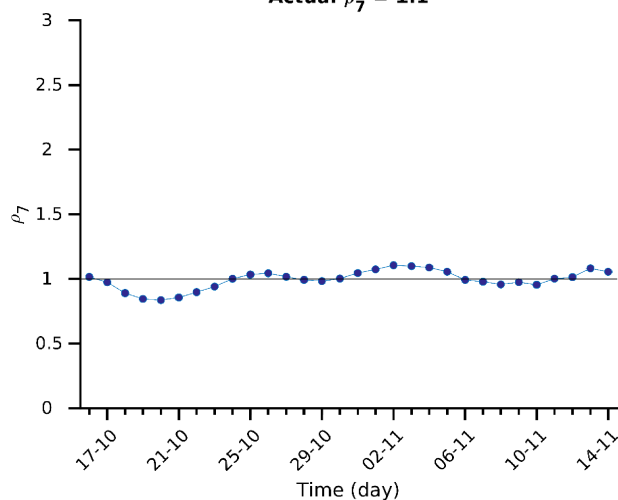
	A14	EPG	CFR	N7	D7
Today	55	58	0.39 %	217	1
A Week ago	53	52	0.31 %	215	1
Maximum	55	70	4.90 %	245	14



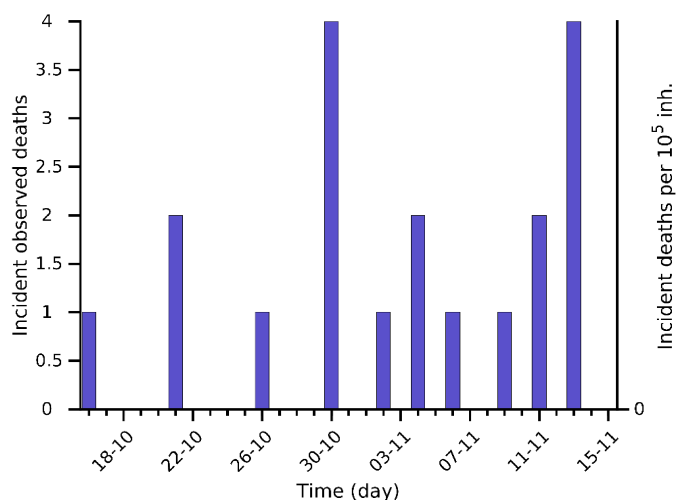
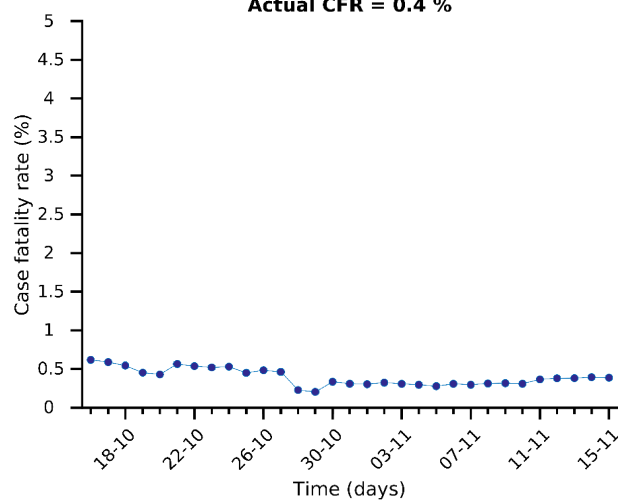
BIOCOM-Cov2 Degree = 6



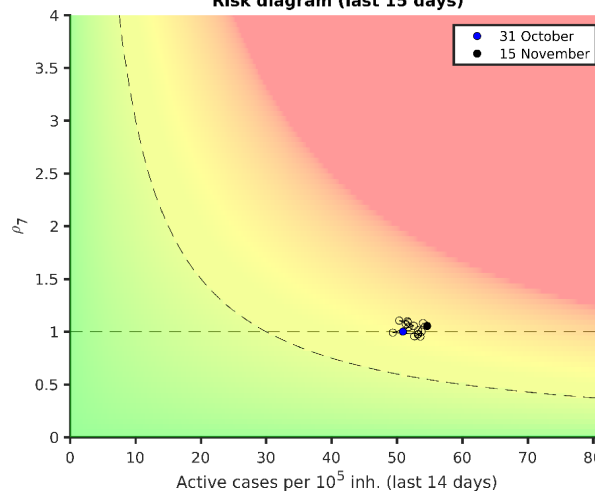
Actual $\rho_7 = 1.1$



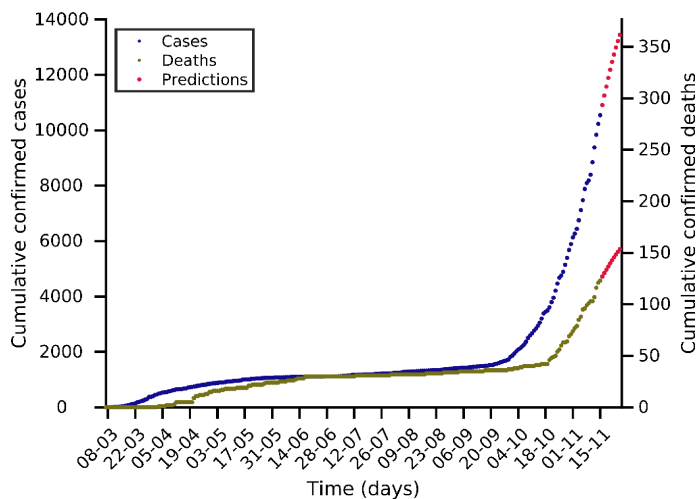
Actual CFR = 0.4 %



Risk diagram (last 15 days)



Latvia 15-11-2020. Pop: 1.9M. Cumulative incidence: 559/10⁵

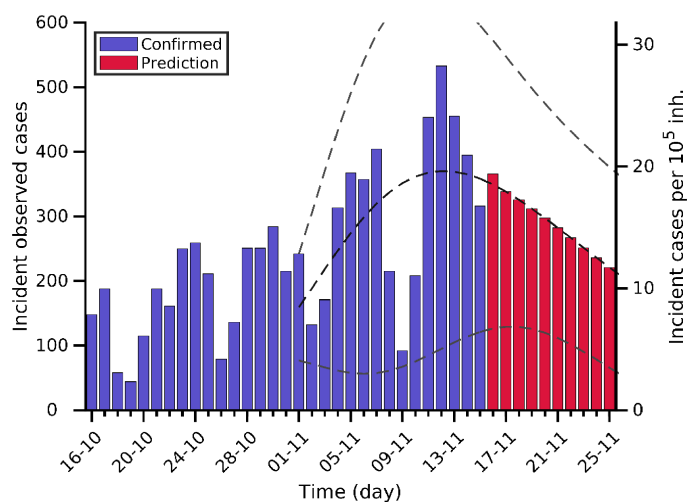


Predictions for next days

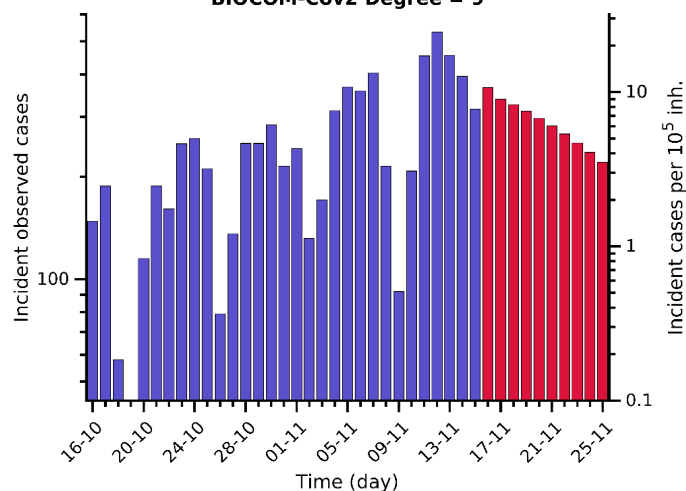
Day	Number of cases	95% Confidence Interval
18-11-2020	11577 (+1030)	[10956 - 12197]
22-11-2020	12735 (+2188)	[11713 - 13757]
25-11-2020	13444 (+2897)	[11916 - 14971]

Current indicators

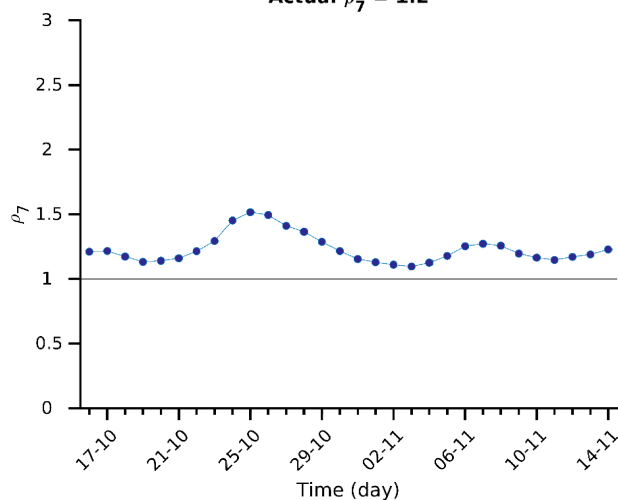
	A14	EPG	CFR	N7	D7
Today	234	287	2.44 %	350	3
A Week ago	181	230	3.15 %	280	4
Maximum	234	287	4.88 %	350	4



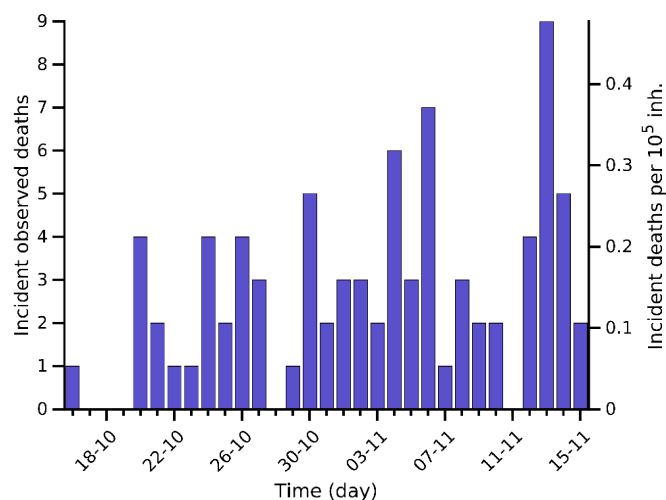
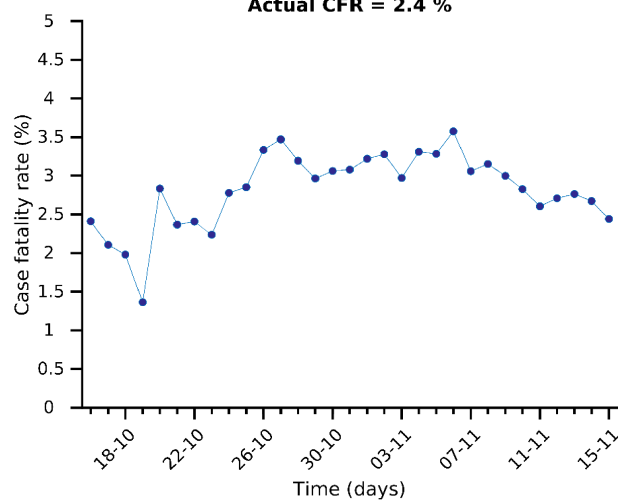
BIOCOM-Cov2 Degree = 9



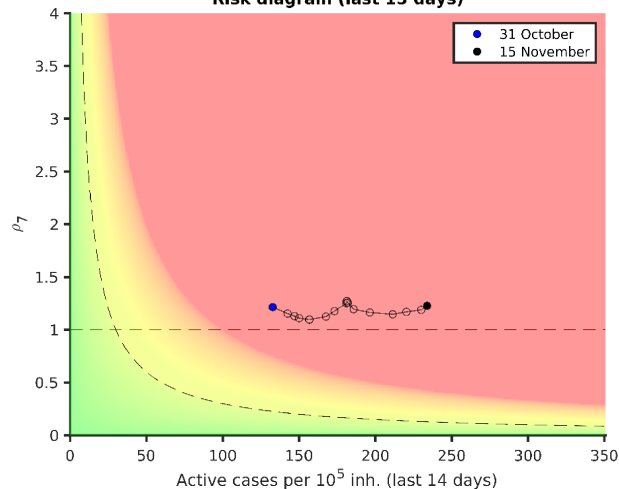
Actual $\rho_7 = 1.2$



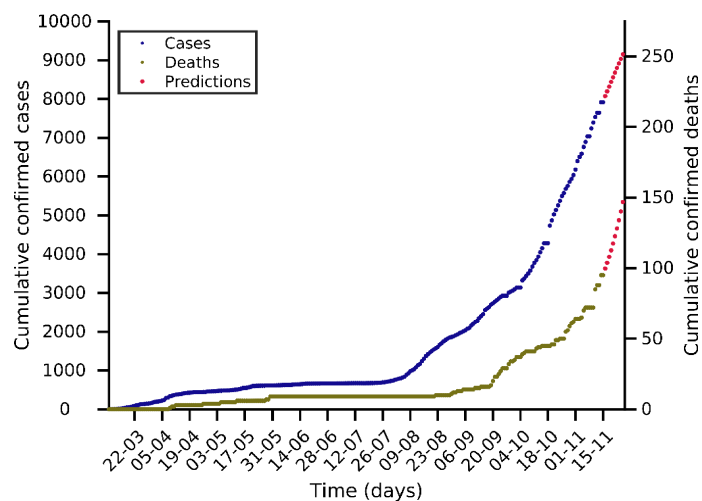
Actual CFR = 2.4 %



Risk diagram (last 15 days)



Malta 15-11-2020. Pop: 0.4M. Cumulative incidence: 1793/10⁵

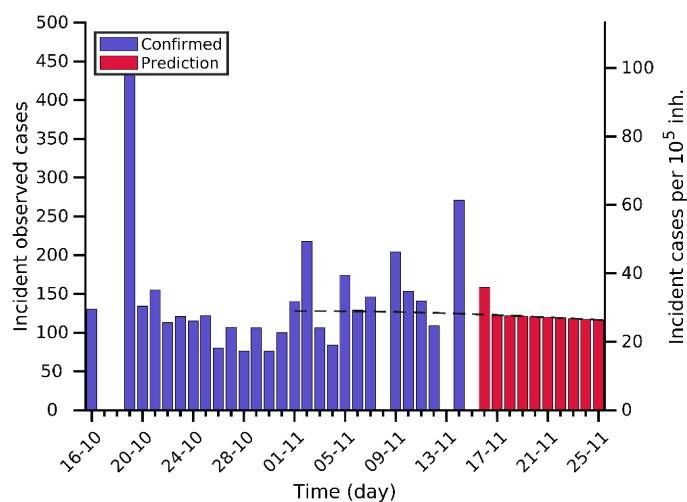


Predictions for next days

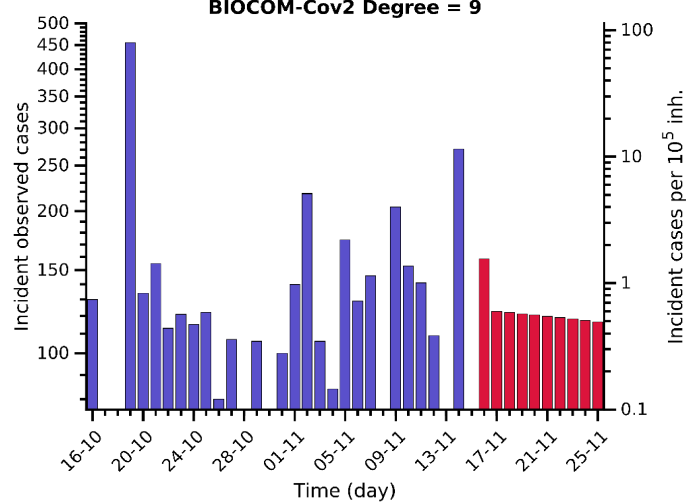
Day	Number of cases	95% Confidence Interval
18-11-2020	8320 (+403)	[7917 - 9488]
22-11-2020	8801 (+884)	[7917 - 11237]
25-11-2020	9153 (+1236)	[7917 - 13589]

Current indicators

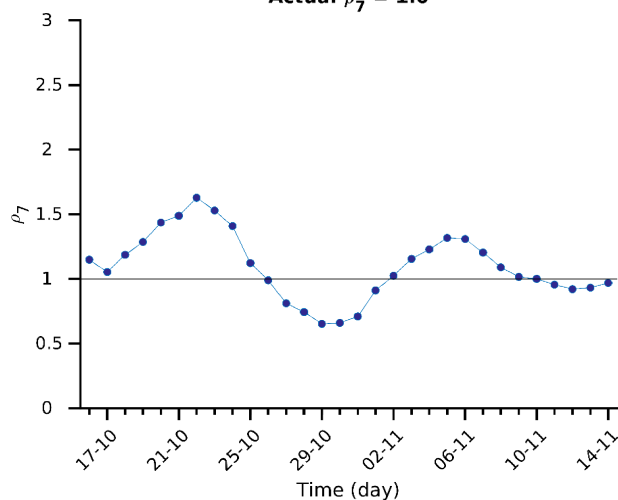
	A14	EPG	CFR	N7	D7
Today	393	381	1.80 %	125	3
A Week ago	349	420	1.92 %	122	1
Maximum	430	619	4.92 %	174	3



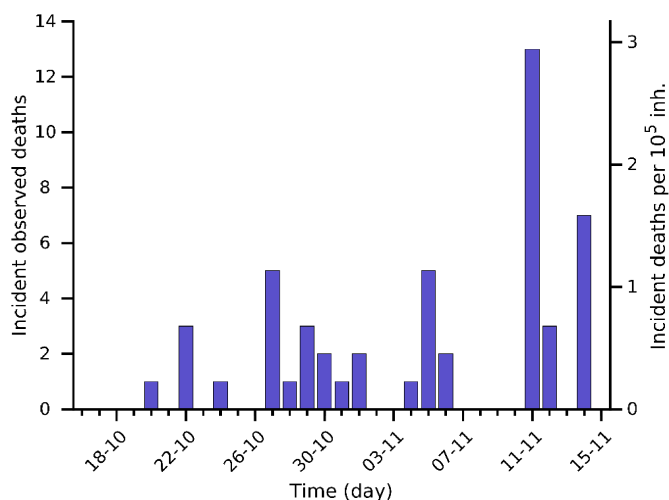
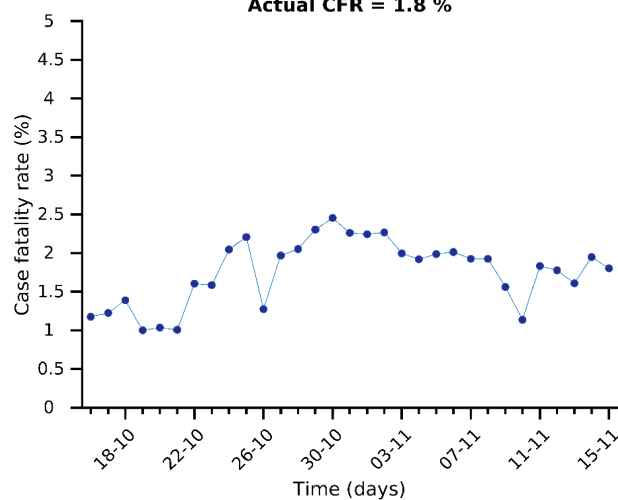
BIOCOM-Cov2 Degree = 9



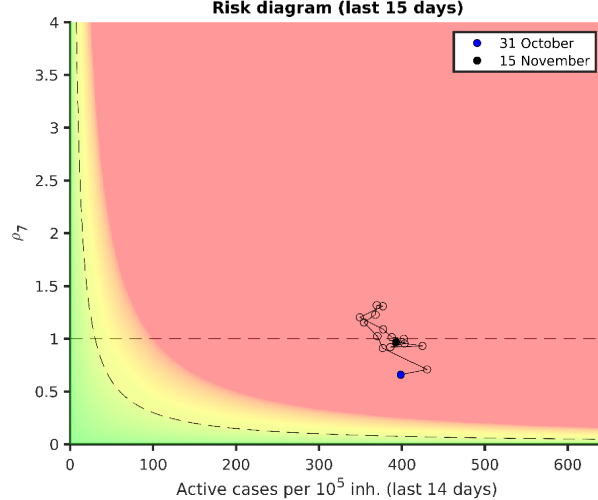
Actual $\rho_7 = 1.0$



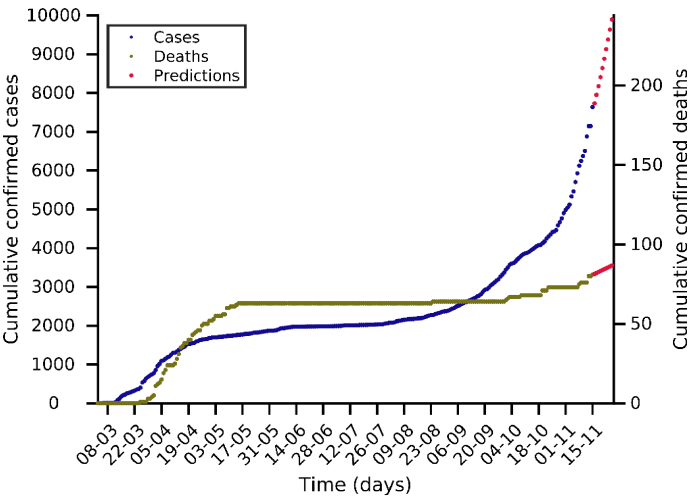
Actual CFR = 1.8 %



Risk diagram (last 15 days)

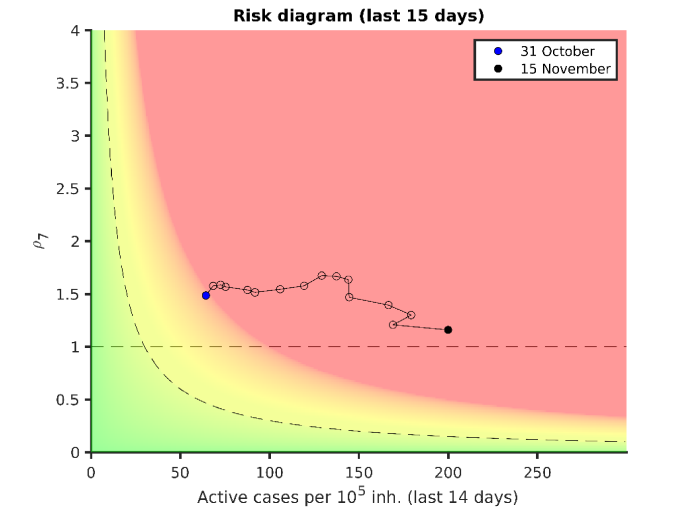
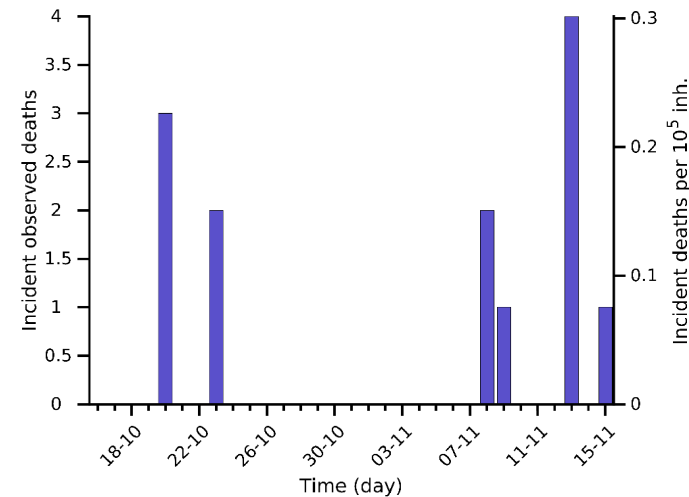
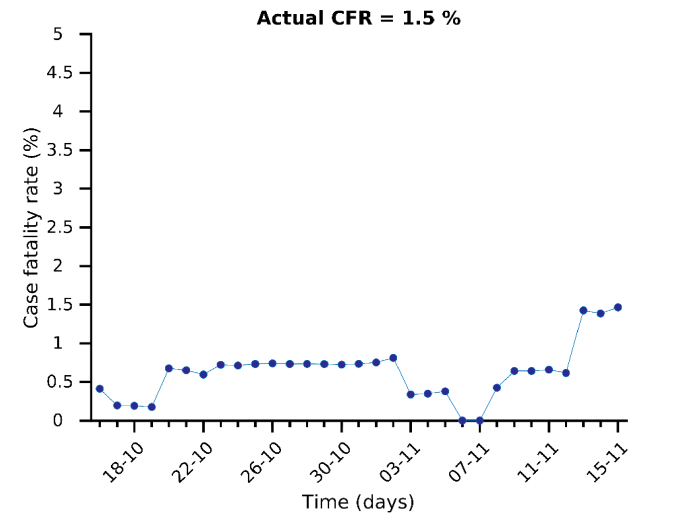
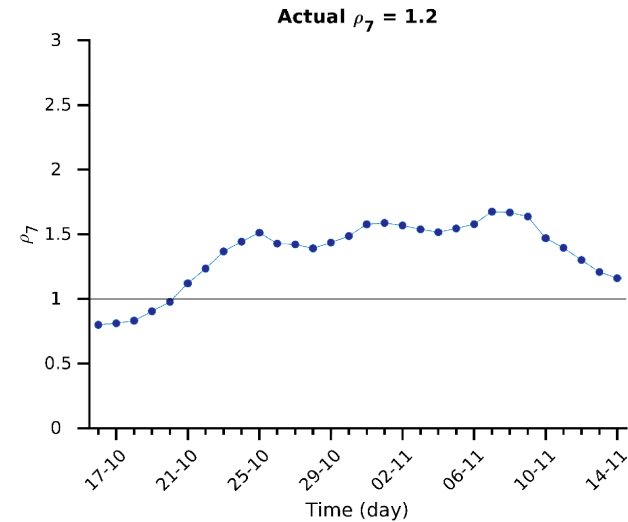
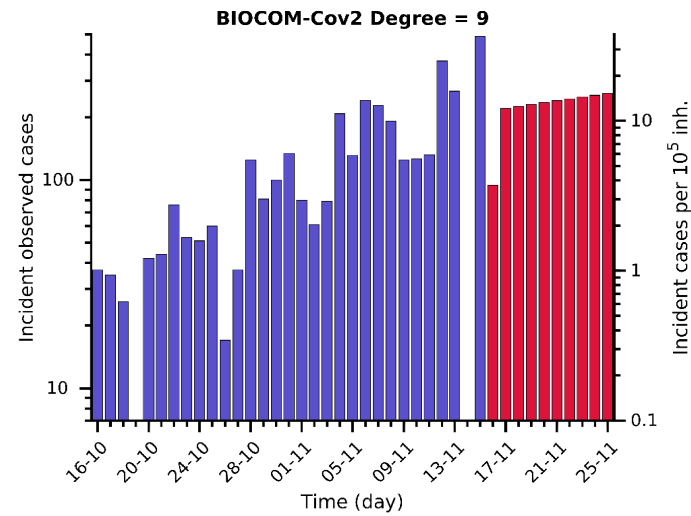
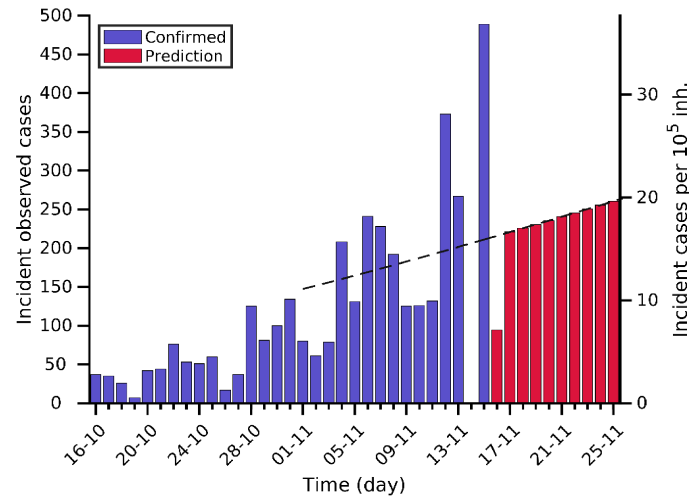


Estonia 15-11-2020. Pop: 1.3M. Cumulative incidence: 576/10⁵

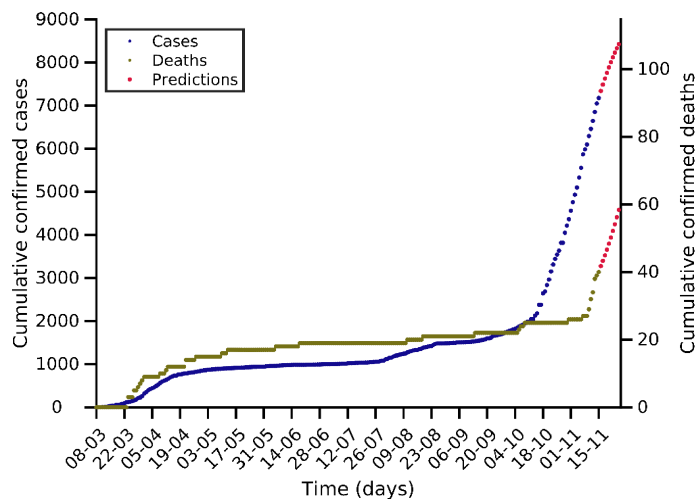


Predictions for next days		
Day	Number of cases	95% Confidence Interval
18-11-2020	8178 (+541)	[7637 - 10402]
22-11-2020	9130 (+1493)	[7637 - 14768]
25-11-2020	9896 (+2259)	[7637 - 21288]

Current indicators					
	A14	EPG	CFR	N7	D7
Today	200	232	1.47 %	216	1
A Week ago	129	216	0.42 %	163	0
Maximum	200	236	4.92 %	216	3



Cyprus 15-11-2020. Pop: 1.2M. Cumulative incidence: 595/10⁵

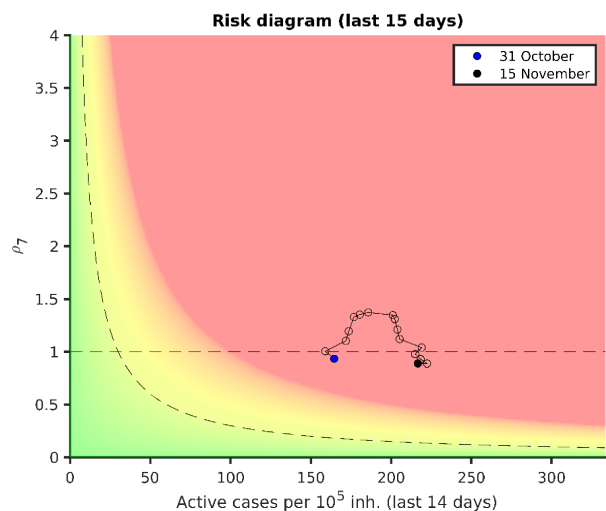
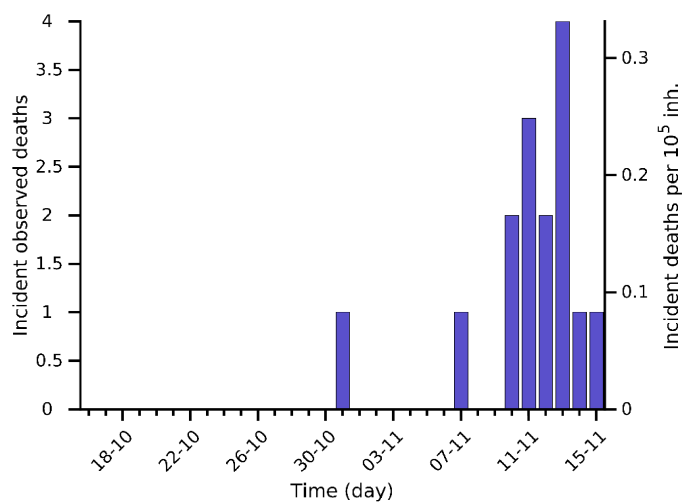
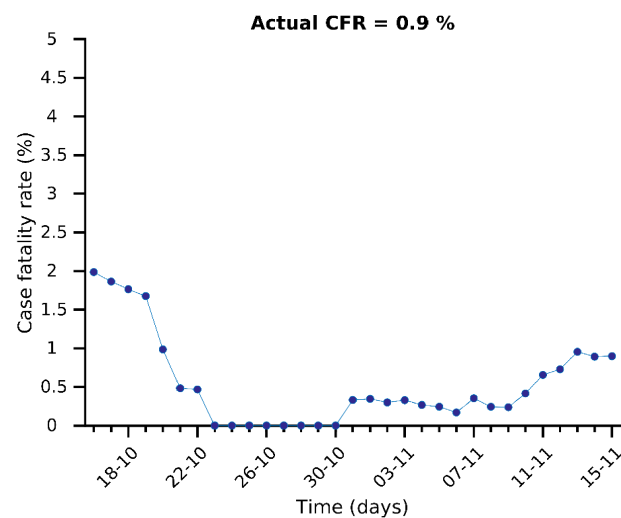
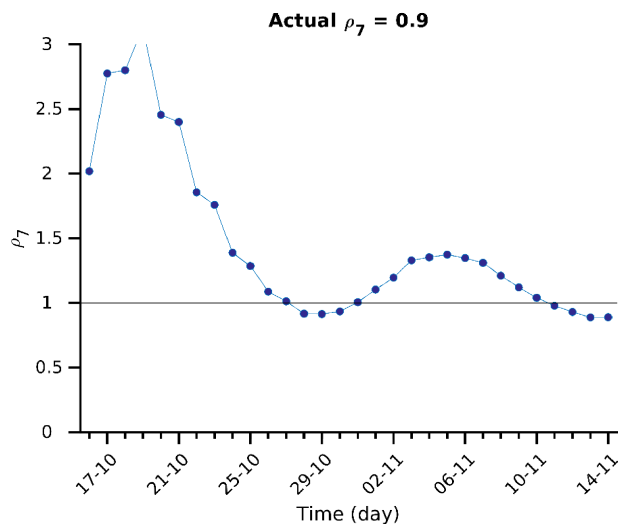
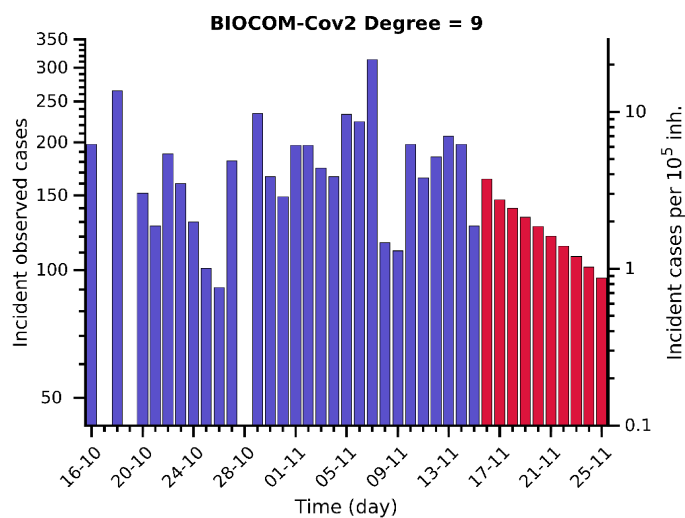
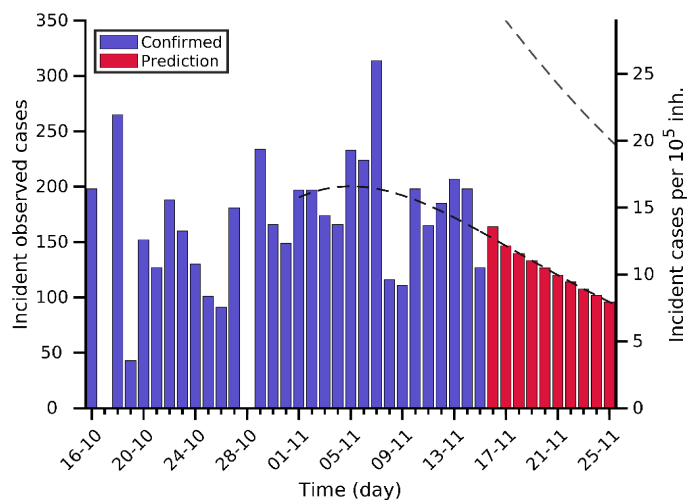


Predictions for next days

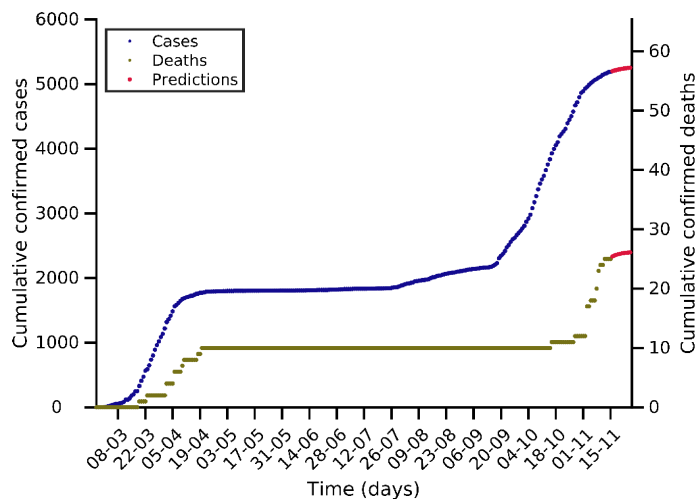
Day	Number of cases	95% Confidence Interval
18-11-2020	7629 (+451)	[7325 - 7932]
22-11-2020	8123 (+945)	[7654 - 8591]
25-11-2020	8428 (+1250)	[7740 - 9116]

Current indicators

	A14	EPG	CFR	N7	D7
Today	217	193	0.90 %	170	2
A Week ago	202	265	0.24 %	203	0
Maximum	222	271	4.48 %	215	2



Iceland 15-11-2020. Pop: 0.3M. Cumulative incidence: 1521/10⁵

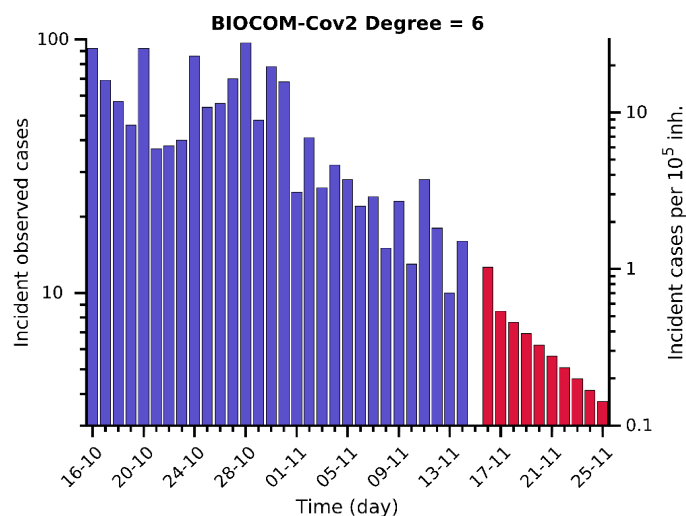
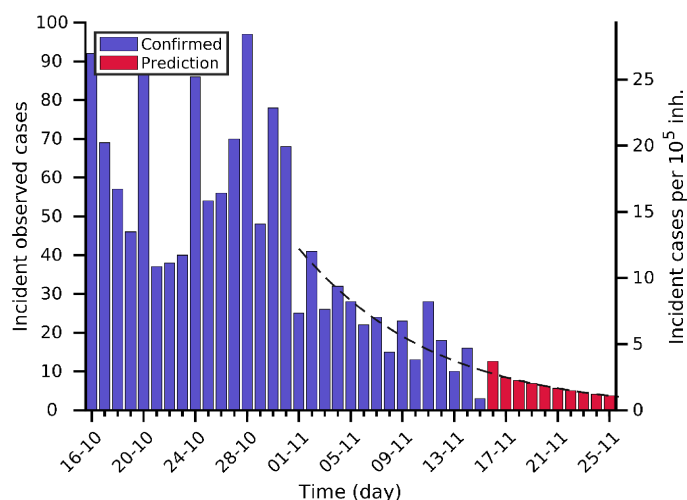


Predictions for next days

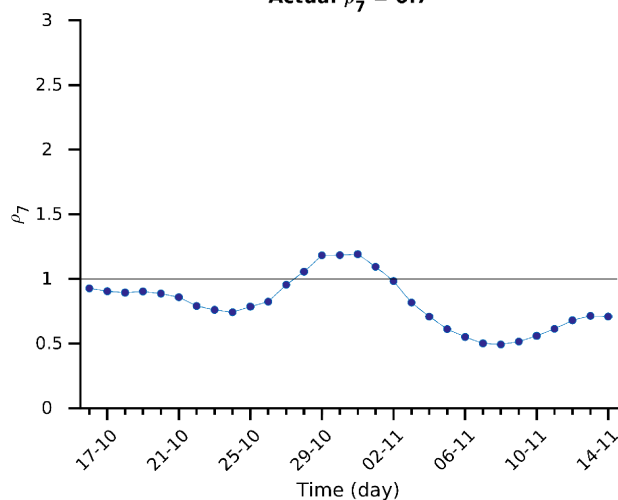
Day	Number of cases	95% Confidence Interval
18-11-2020	5218 (+29)	[5189 - 5276]
22-11-2020	5242 (+53)	[5189 - 5319]
25-11-2020	5254 (+65)	[5189 - 5346]

Current indicators

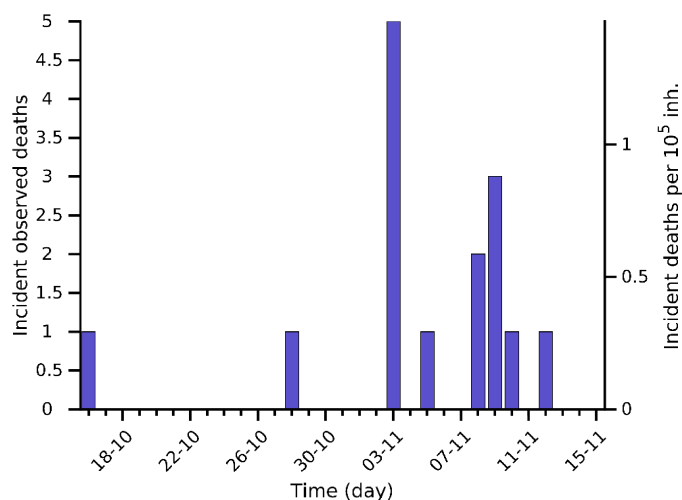
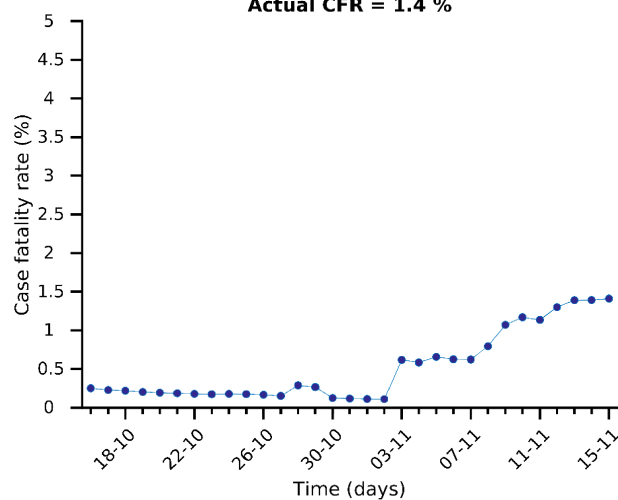
	A14	EPG	CFR	N7	D7
Today	88	62	1.41 %	16	1
A Week ago	185	93	0.79 %	27	1
Maximum	332	469	4.65 %	86	2



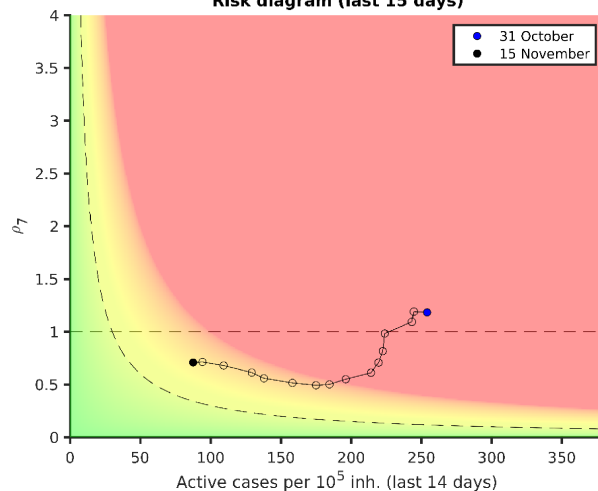
Actual $\rho_7 = 0.7$



Actual CFR = 1.4 %

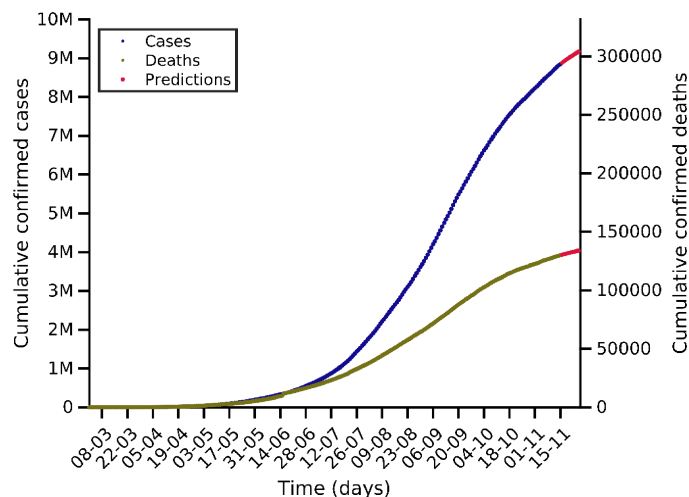


Risk diagram (last 15 days)



(2) Analysis and prediction of COVID-19 for other countries

India 15-11-2020. Pop: 1353.0M. Cumulative incidence: 654/10⁵

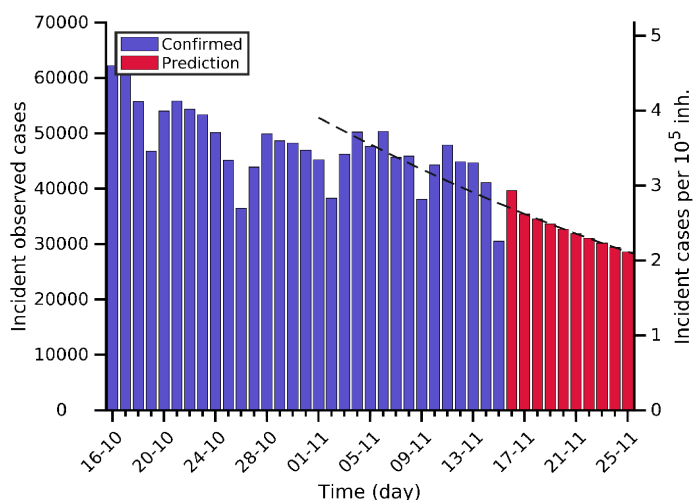


Predictions for next days

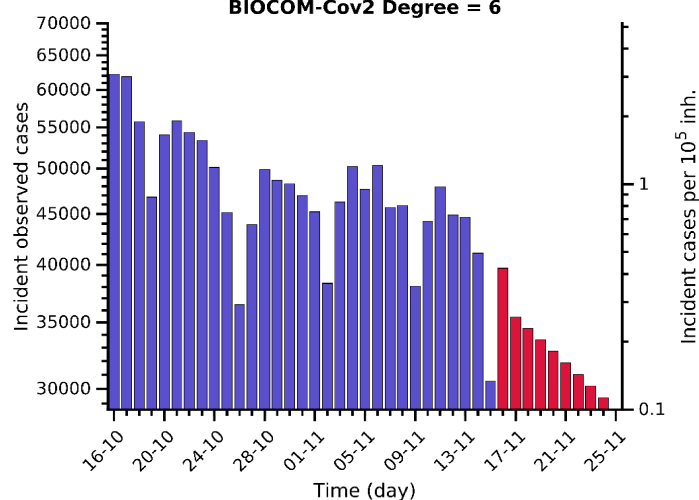
Day	Number of cases	95% Confidence Interval
18-11-2020	8954763 (+109636)	[8887349 - 9022178]
22-11-2020	9083997 (+238870)	[8961686 - 9206307]
25-11-2020	9172168 (+327041)	[8967311 - 9377025]

Current indicators

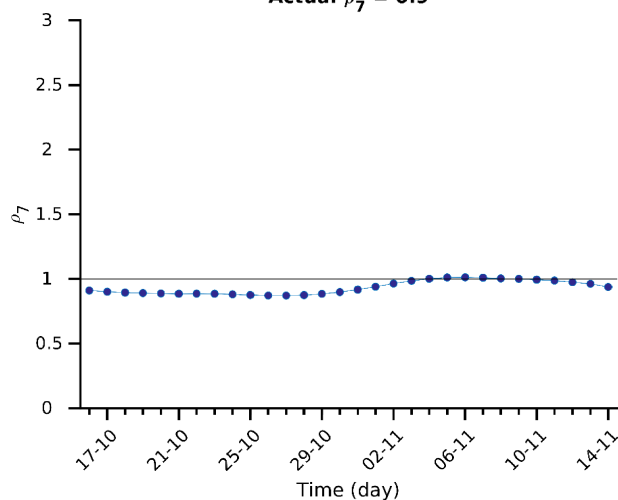
	A14	EPG	CFR	N7	D7
Today	46	43	0.95 %	41639	494
A Week ago	48	48	0.82 %	46335	572
Maximum	95	98	4.40 %	93199	1168



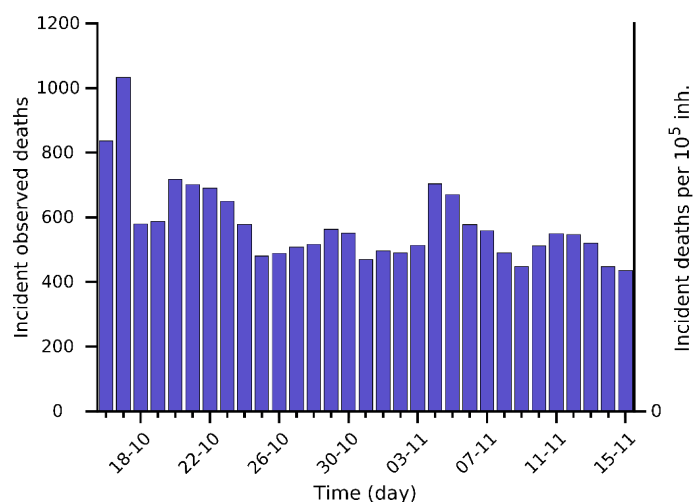
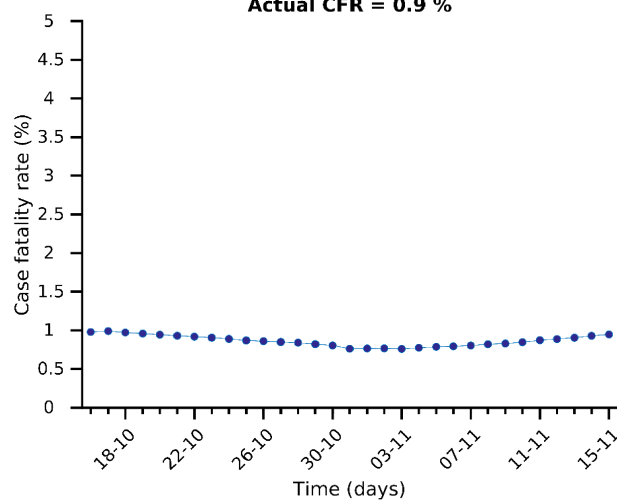
BIOCOM-Cov2 Degree = 6



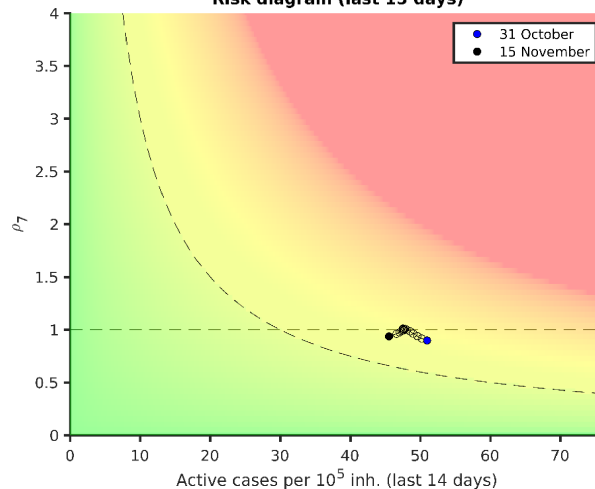
Actual $\rho_7 = 0.9$



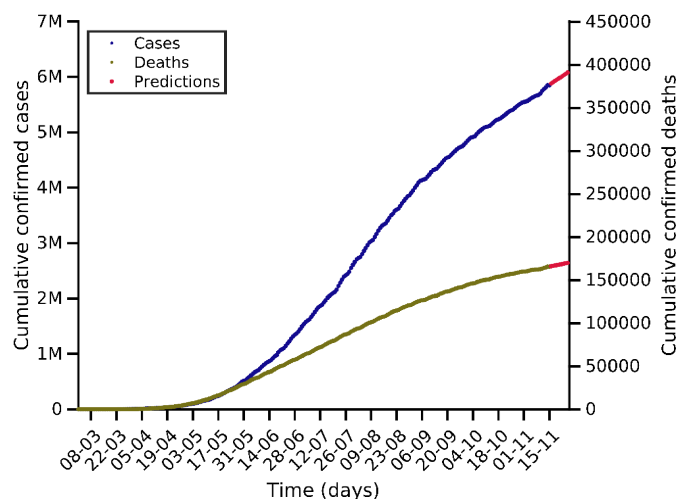
Actual CFR = 0.9 %



Risk diagram (last 15 days)



Brazil 15-11-2020. Pop: 212.6M. Cumulative incidence: 2752/10⁵

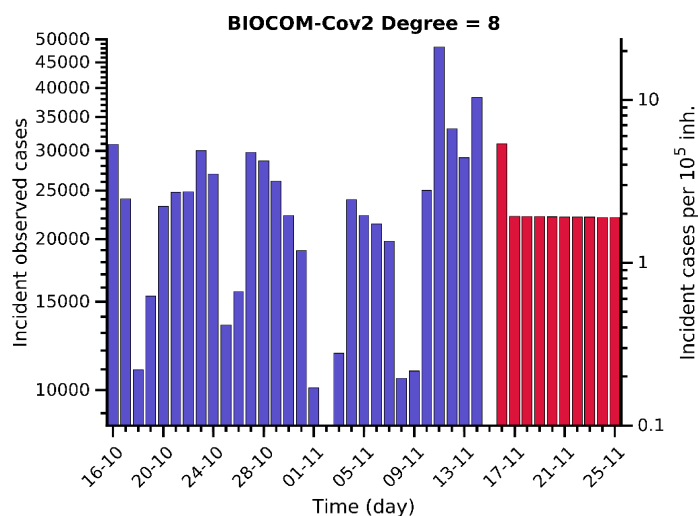
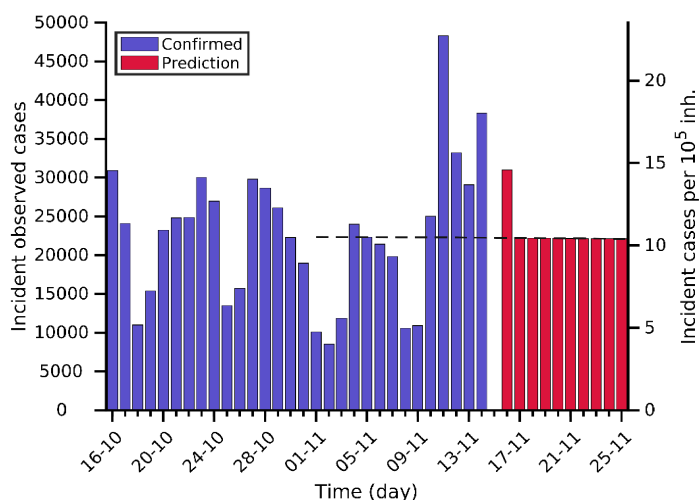


Predictions for next days

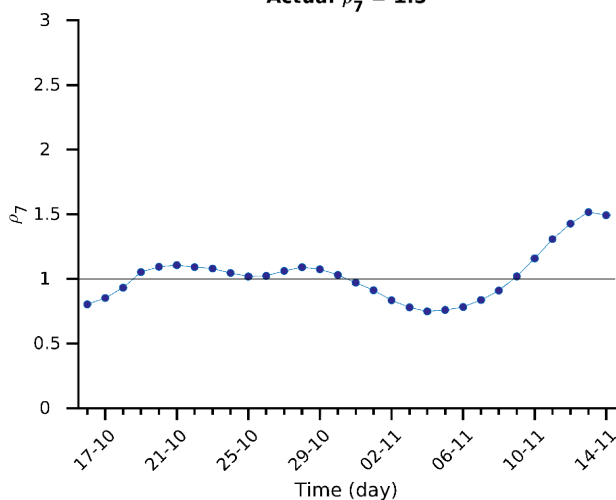
Day	Number of cases	95% Confidence Interval
18-11-2020	5924344 (+75385)	[5848959 - 6121859]
22-11-2020	6012986 (+164027)	[5848959 - 6454174]
25-11-2020	6079304 (+230345)	[5848959 - 6916126]

Current indicators

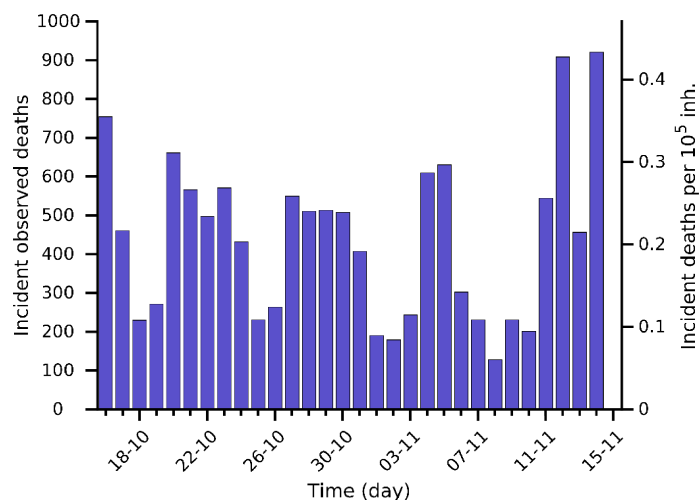
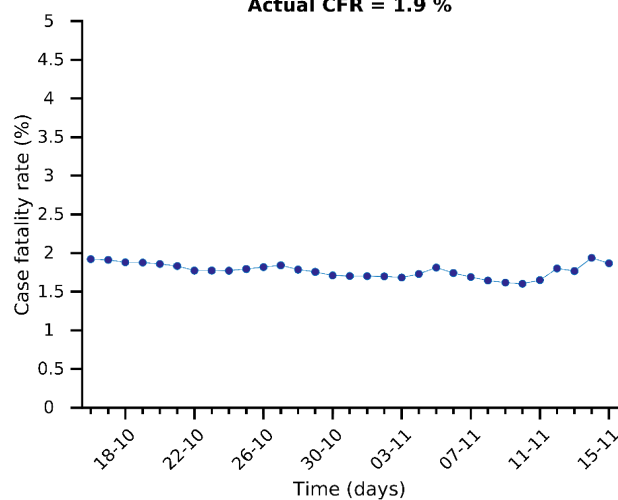
	A14	EPG	CFR	N7	D7
Today	143	213	1.87 %	26406	466
A Week ago	127	106	1.64 %	16916	332
Maximum	302	349	4.84 %	46393	1097



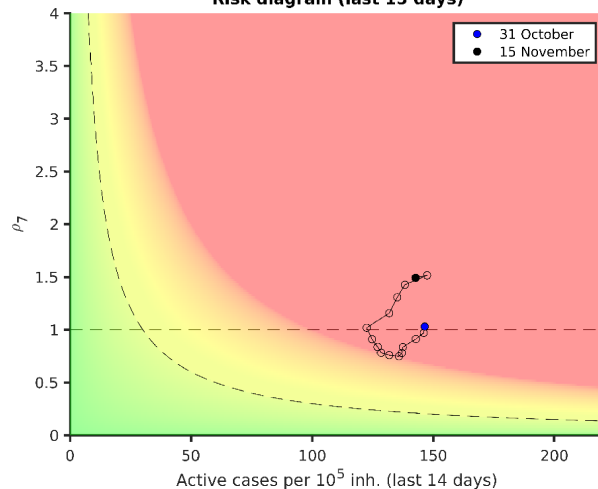
Actual $\rho_7 = 1.5$



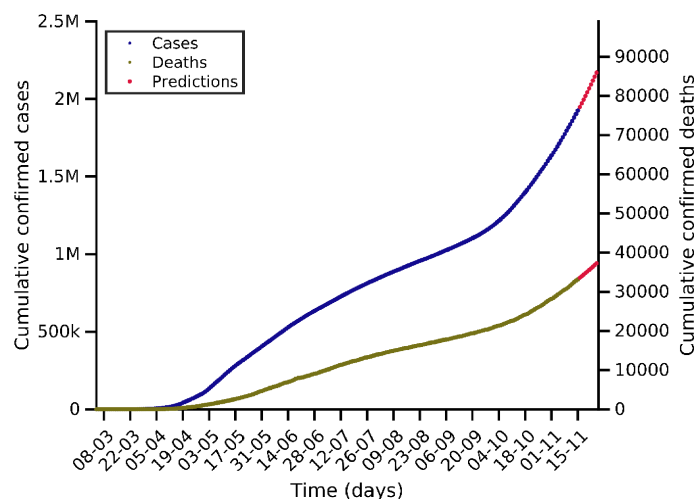
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Russia 15-11-2020. Pop: 145.9M. Cumulative incidence: 1320/10⁵

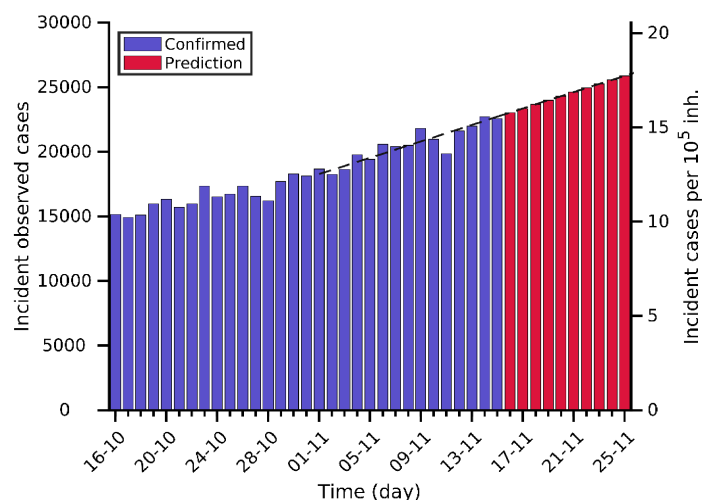


Predictions for next days

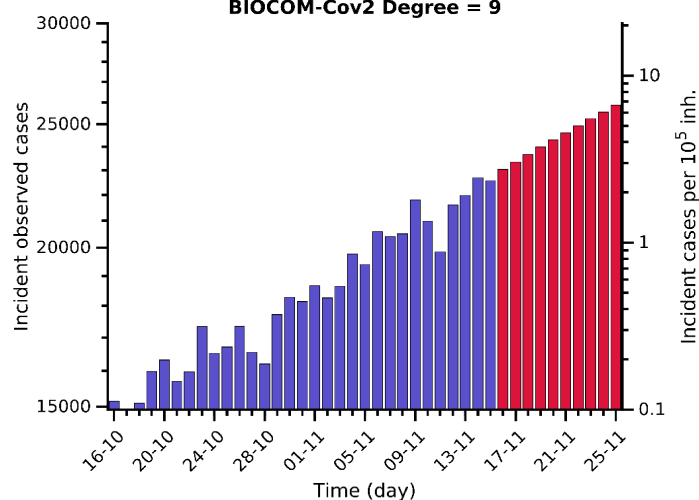
Day	Number of cases	95% Confidence Interval
18-11-2020	1995882 (+70057)	[1992084 - 1999681]
22-11-2020	2093723 (+167898)	[2084563 - 2102884]
25-11-2020	2170408 (+244583)	[2152328 - 2188487]

Current indicators

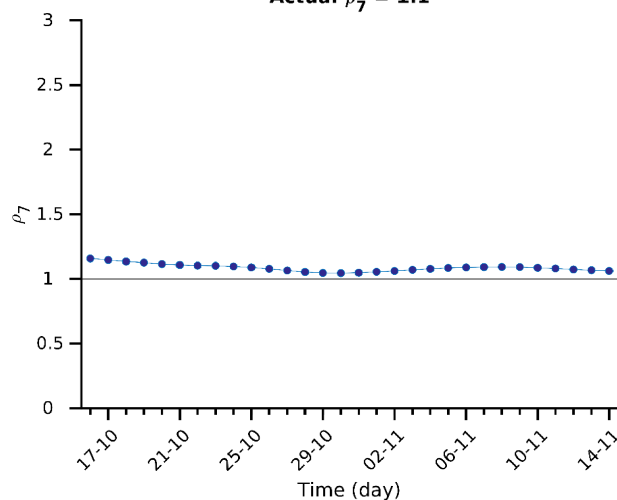
	A14	EPG	CFR	N7	D7
Today	198	210	2.30 %	21642	378
A Week ago	178	195	2.43 %	19650	329
Maximum	198	210	4.72 %	21642	378



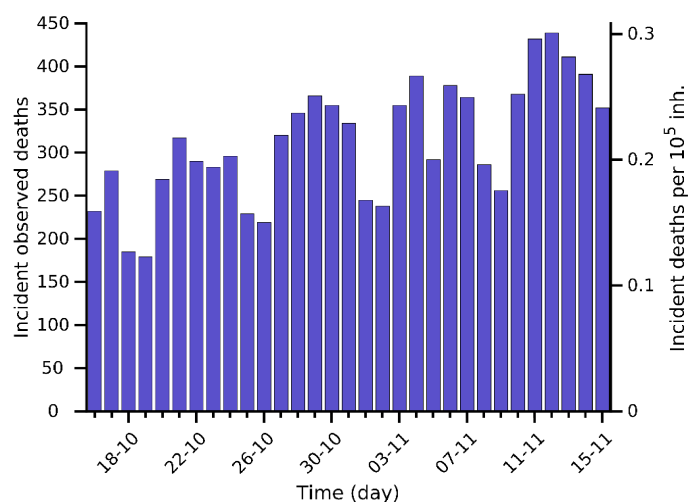
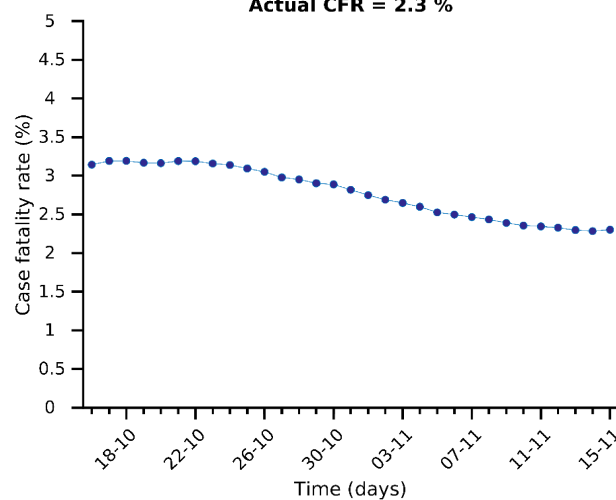
BIOCOM-Cov2 Degree = 9



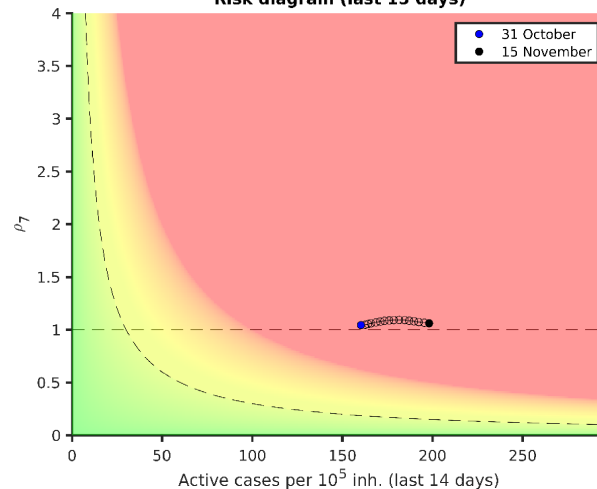
Actual $\rho_7 = 1.1$



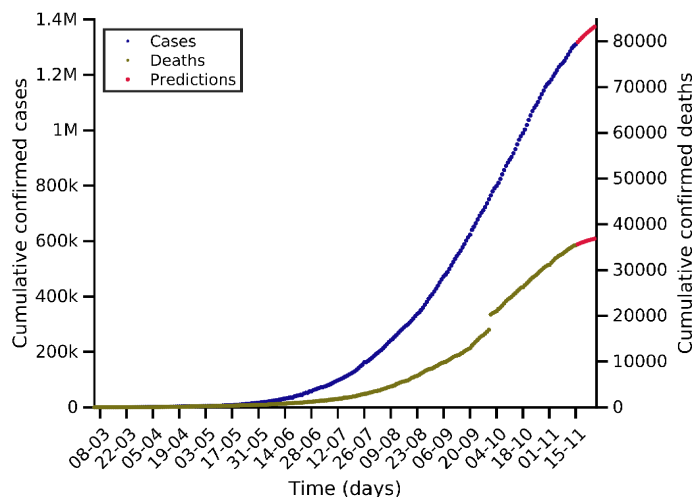
Actual CFR = 2.3 %



Risk diagram (last 15 days)



Argentina 15-11-2020. Pop: 45.2M. Cumulative incidence: 2900/10⁵

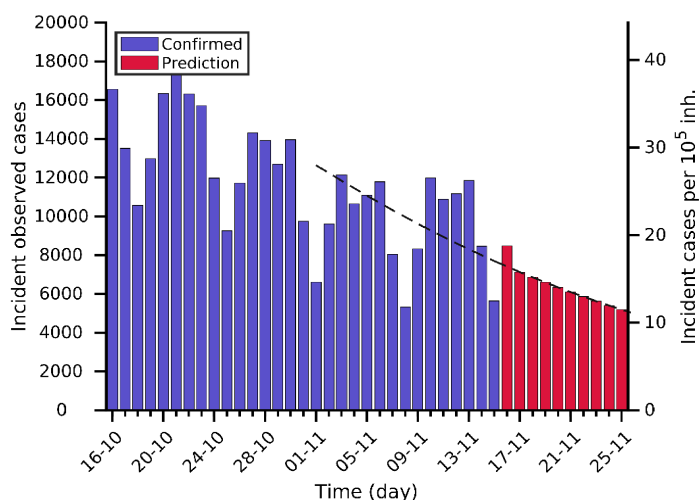


Predictions for next days

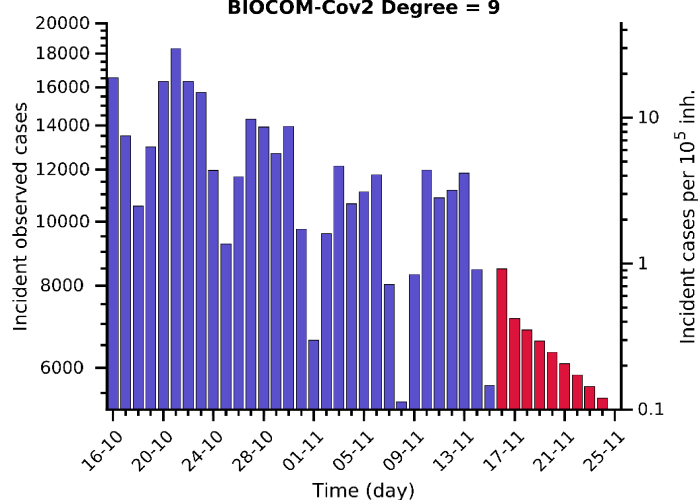
Day	Number of cases	95% Confidence Interval
18-11-2020	1332948 (+22472)	[1310476 - 1356521]
22-11-2020	1357831 (+47355)	[1318607 - 1397055]
25-11-2020	1374049 (+63573)	[1312290 - 1435807]

Current indicators

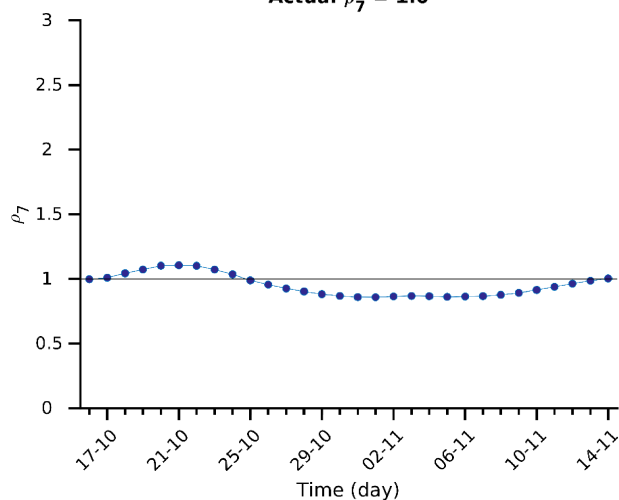
	A14	EPG	CFR	N7	D7
Today	303	304	2.19 %	9758	268
A Week ago	335	291	2.44 %	9807	346
Maximum	442	483	4.91 %	15051	789



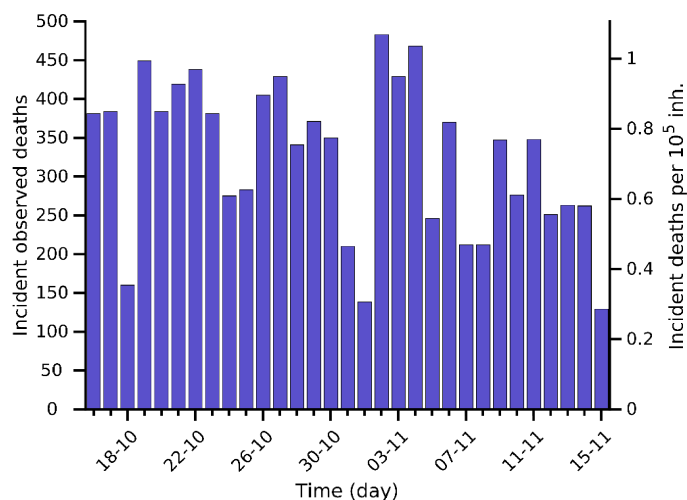
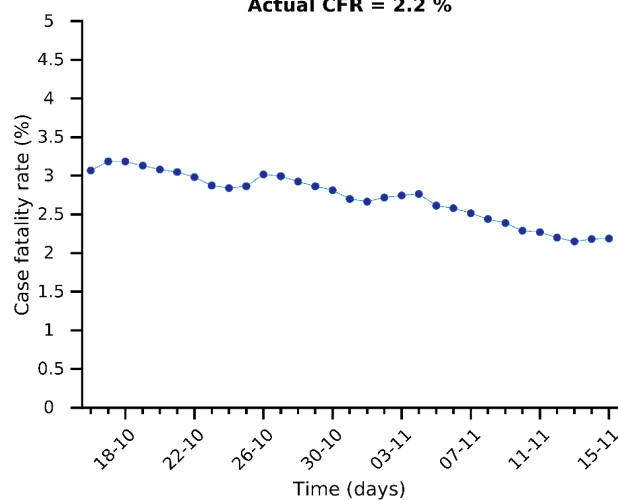
BIOCOM-Cov2 Degree = 9



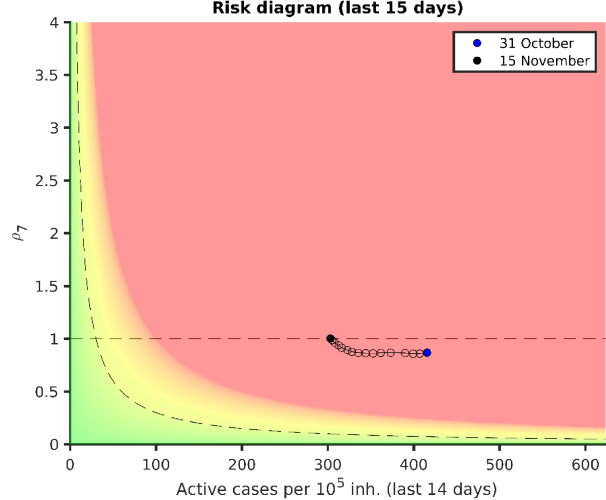
Actual $\rho_7 = 1.0$



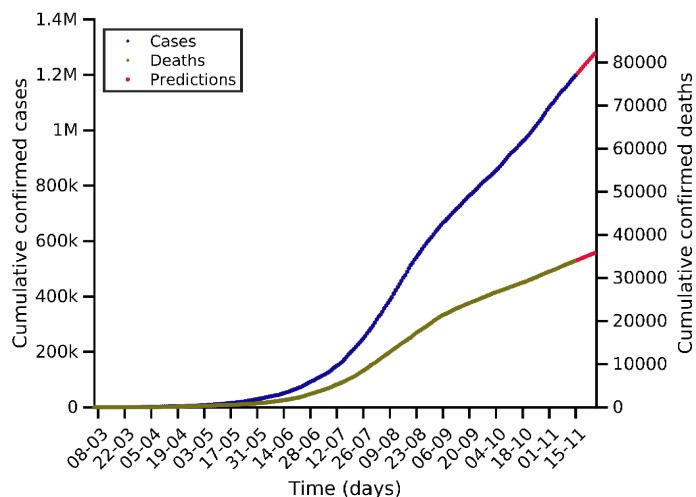
Actual CFR = 2.2 %



Risk diagram (last 15 days)



Colombia 15-11-2020. Pop: 50.9M. Cumulative incidence: 2356/10⁵

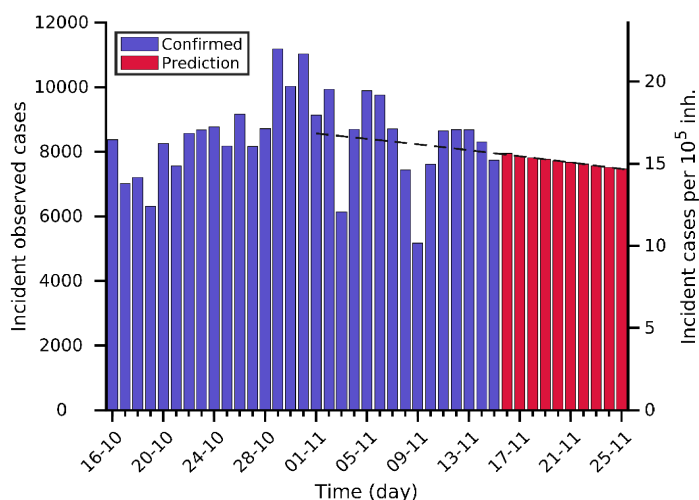


Predictions for next days

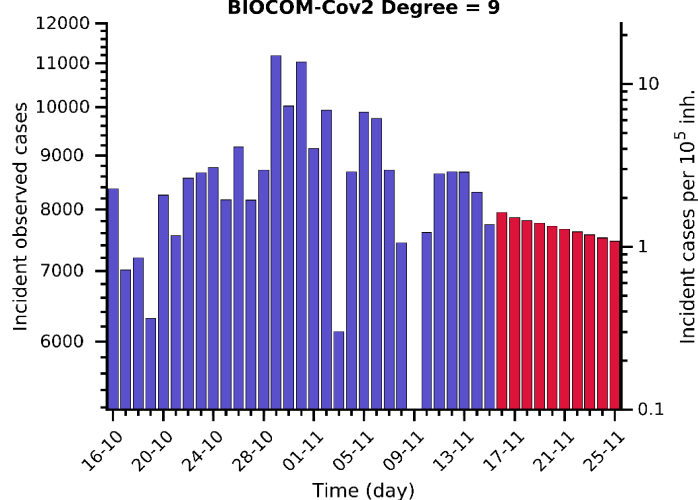
Day	Number of cases	95% Confidence Interval
18-11-2020	1222372 (+23626)	[1217107 - 1227637]
22-11-2020	1253143 (+54397)	[1244949 - 1261338]
25-11-2020	1275706 (+76960)	[1263031 - 1288380]

Current indicators

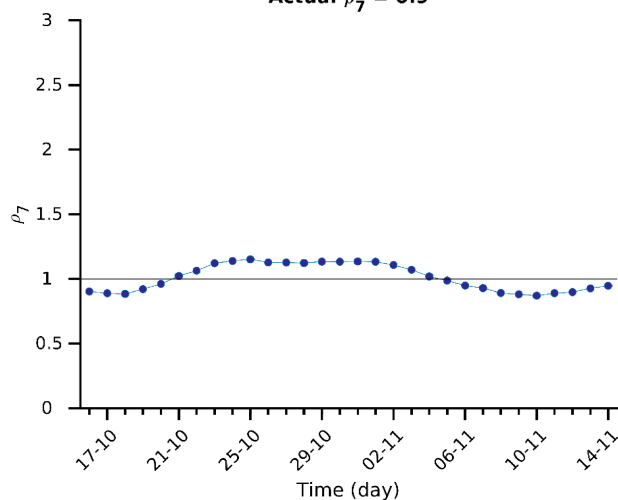
	A14	EPG	CFR	N7	D7
Today	227	215	2.41 %	7837	177
A Week ago	252	234	2.52 %	8652	182
Maximum	307	329	4.88 %	11550	326



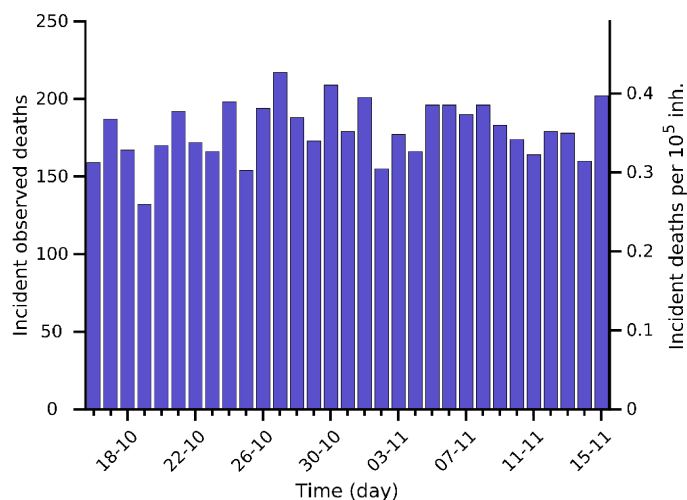
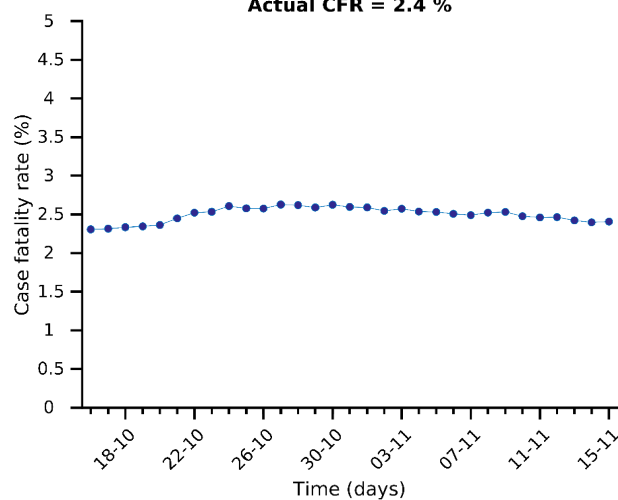
BIOCOM-Cov2 Degree = 9



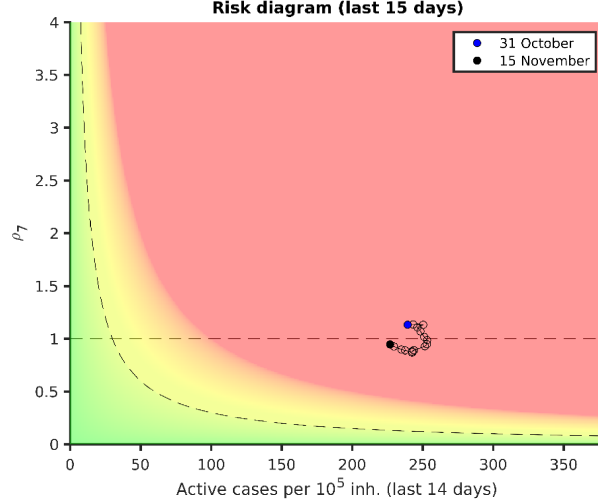
Actual $\rho_7 = 0.9$



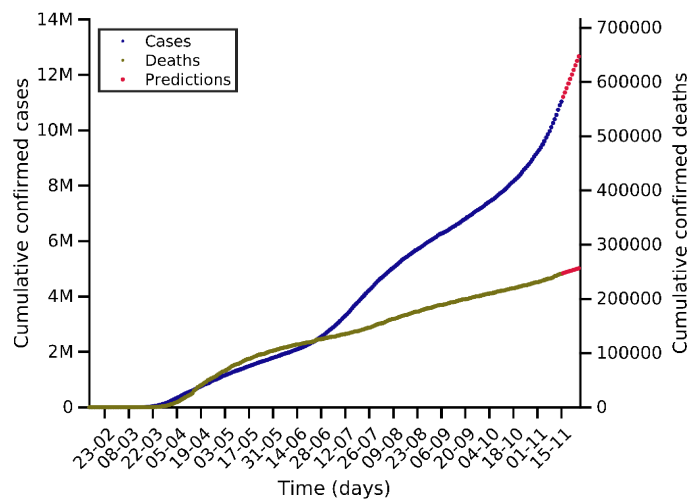
Actual CFR = 2.4 %



Risk diagram (last 15 days)

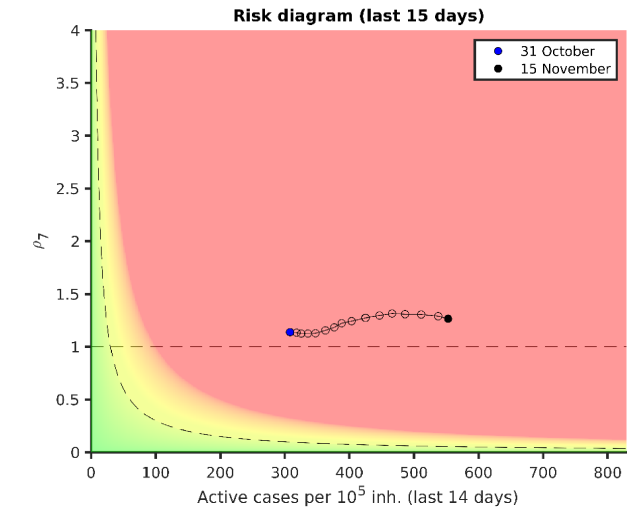
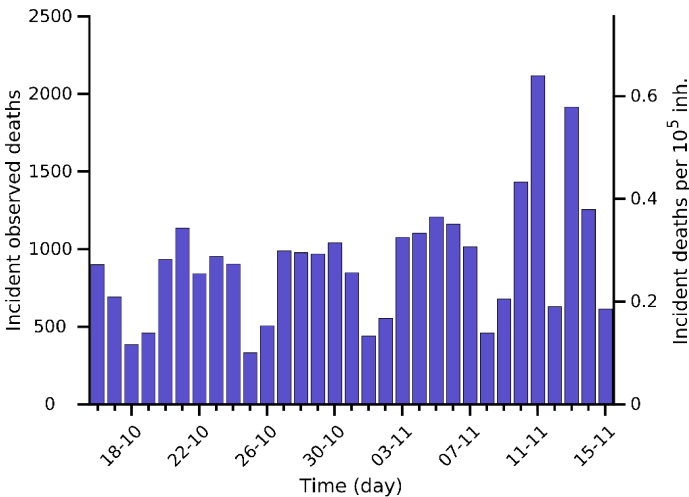
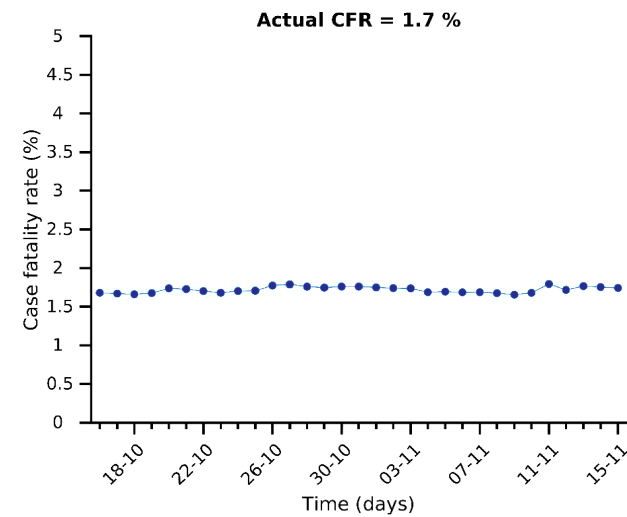
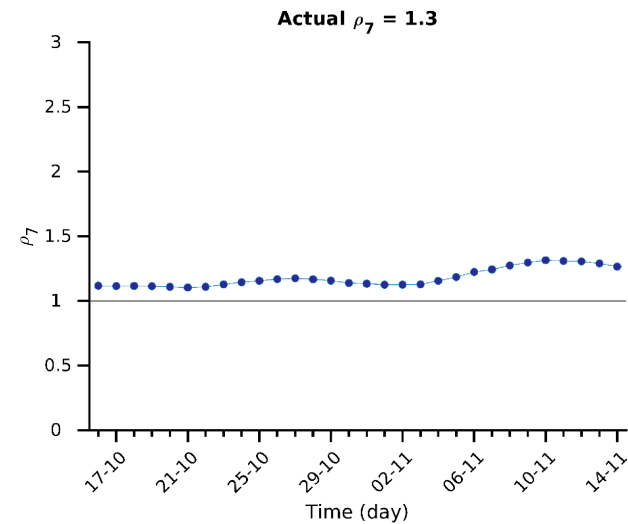
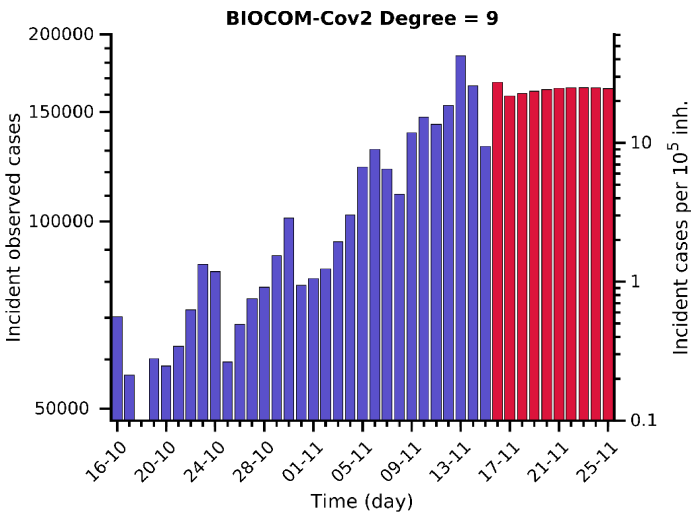
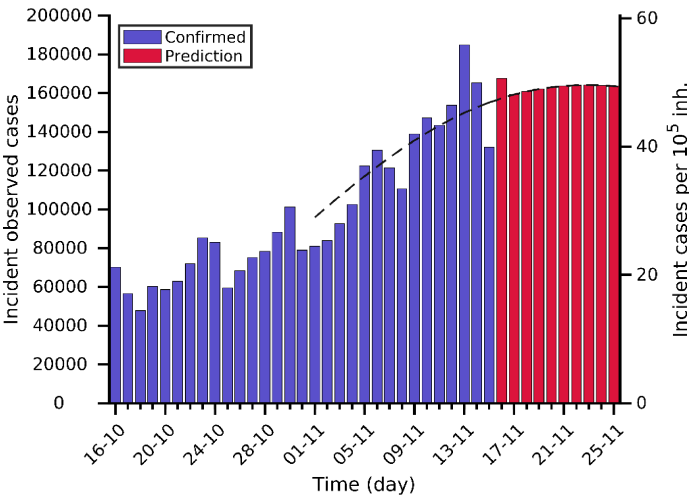


USA 15-11-2020. Pop: 331.0M. Cumulative incidence: 3334/10⁵

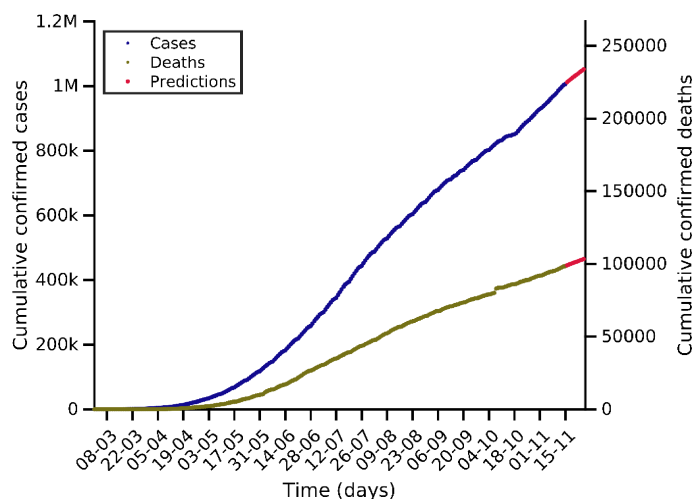


Predictions for next days		
Day	Number of cases	95% Confidence Interval
18-11-2020	11524649 (+487588)	[11308903 - 11740395]
22-11-2020	12177594 (+1140533)	[11699772 - 12655416]
25-11-2020	12669468 (+1632407)	[11786407 - 13552529]

Current indicators					
	A14	EPG	CFR	N7	D7
Today	553	699	1.74 %	152201	1235
A Week ago	403	502	1.68 %	109184	939
Maximum	553	699	5.00 %	152201	2715



Mexico 15-11-2020. Pop: 128.9M. Cumulative incidence: 781/10⁵

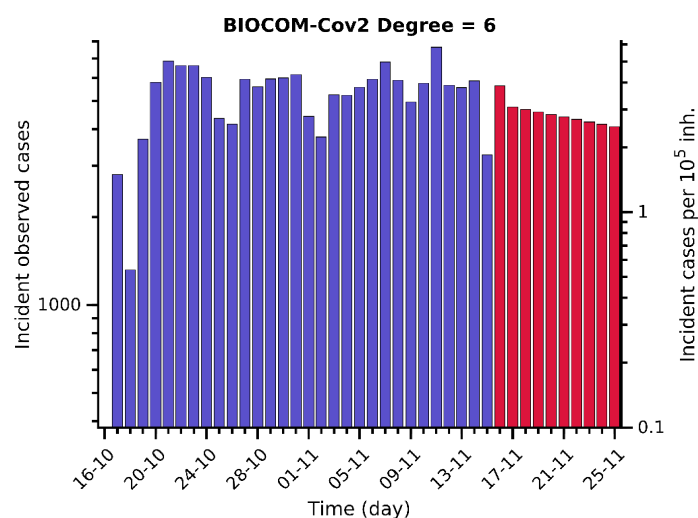
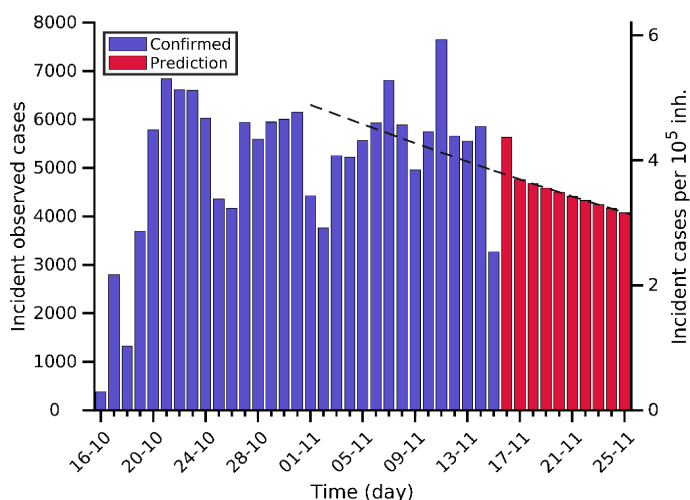


Predictions for next days

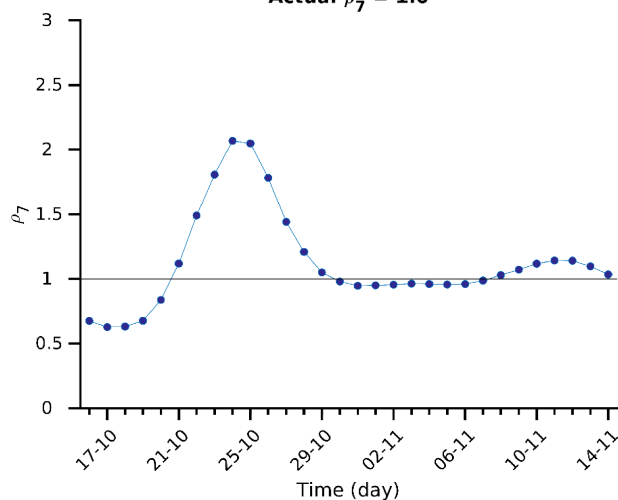
Day	Number of cases	95% Confidence Interval
18-11-2020	1021593 (+15071)	[1006522 - 1037662]
22-11-2020	1039416 (+32894)	[1008658 - 1070174]
25-11-2020	1051897 (+45375)	[1006522 - 1105156]

Current indicators

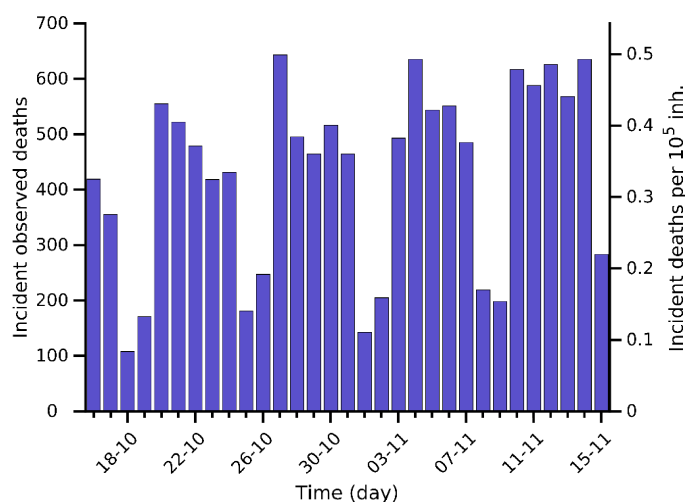
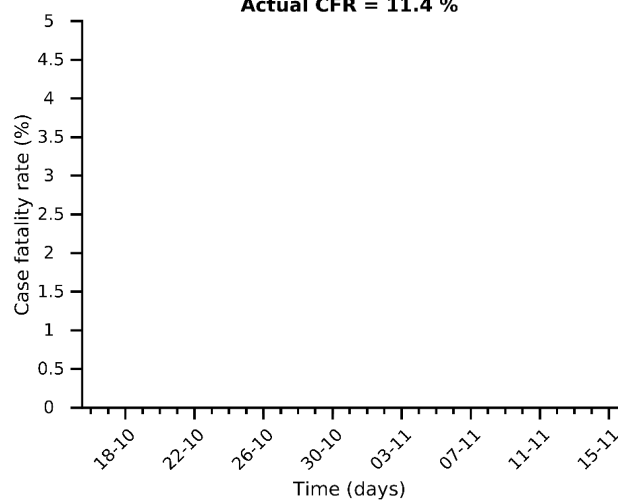
	A14	EPG	CFR	N7	D7
Today	60	62	10.00 %	5528	502
A Week ago	59	59	10.00 %	5490	447
Maximum	77	94	0.00 %	7171	800



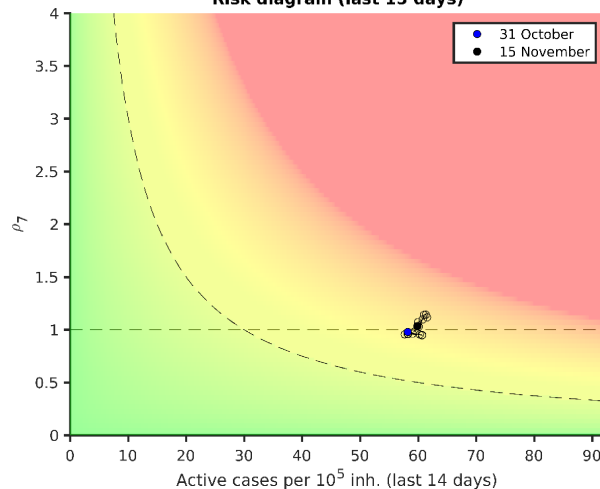
Actual $\rho_7 = 1.0$



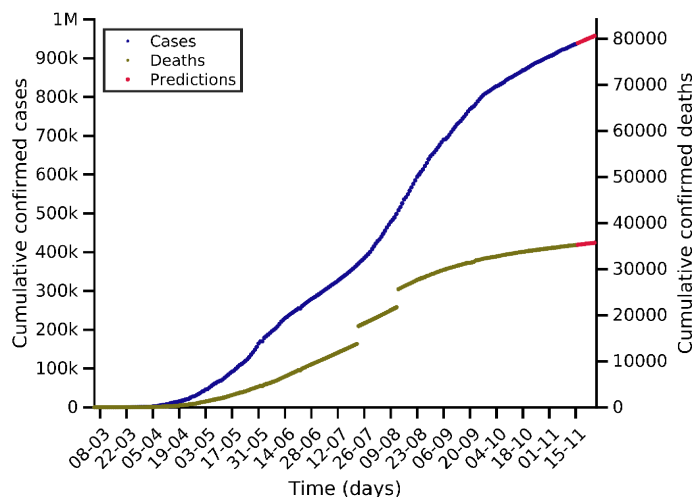
Actual CFR = 11.4 %



Risk diagram (last 15 days)



Peru 15-11-2020. Pop: 33.0M. Cumulative incidence: 2842/10⁵

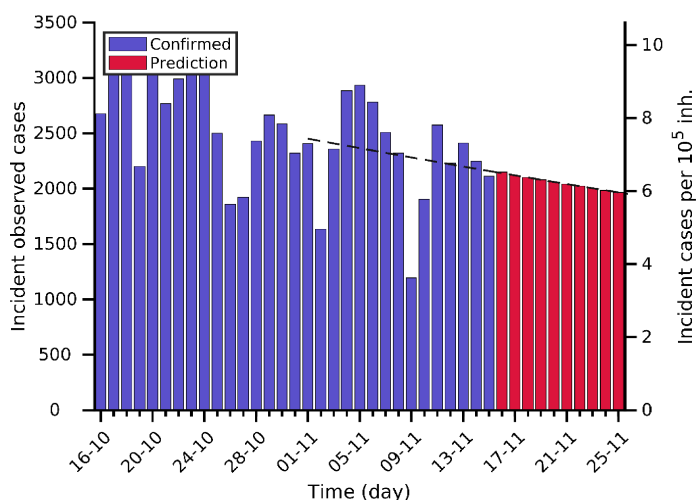


Predictions for next days

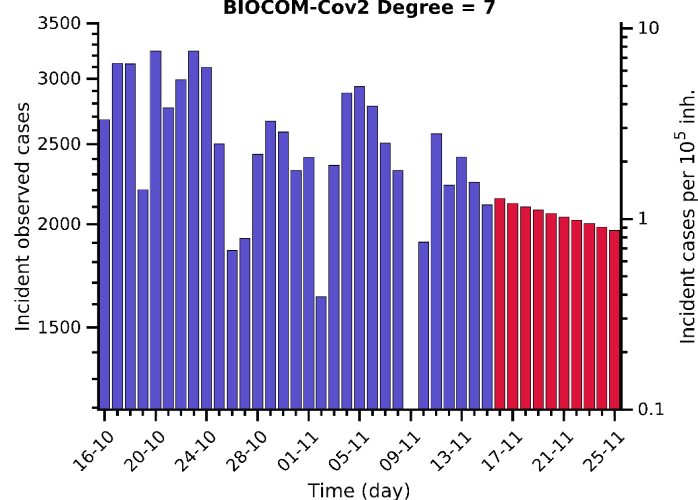
Day	Number of cases	95% Confidence Interval
18-11-2020	943381 (+6370)	[941322 - 945439]
22-11-2020	951588 (+14577)	[947861 - 955315]
25-11-2020	957543 (+20532)	[951296 - 963790]

Current indicators

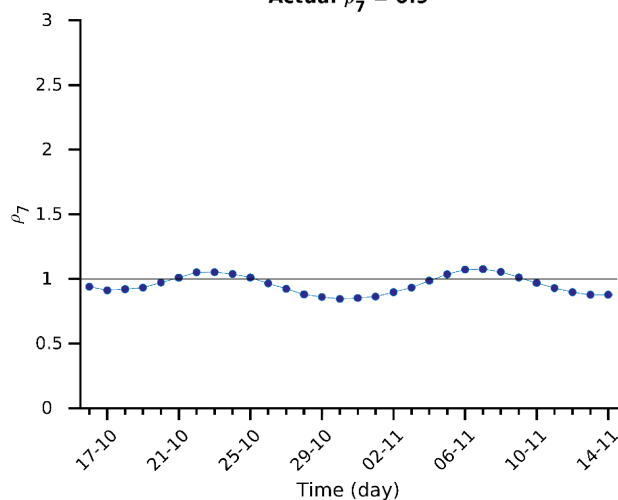
	A14	EPG	CFR	N7	D7
Today	97	85	1.78 %	2097	50
A Week ago	102	110	1.80 %	2489	50
Maximum	357	383	4.98 %	8552	747



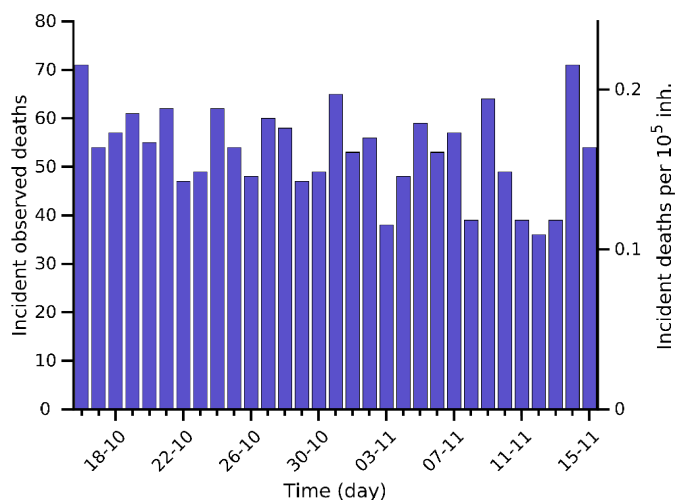
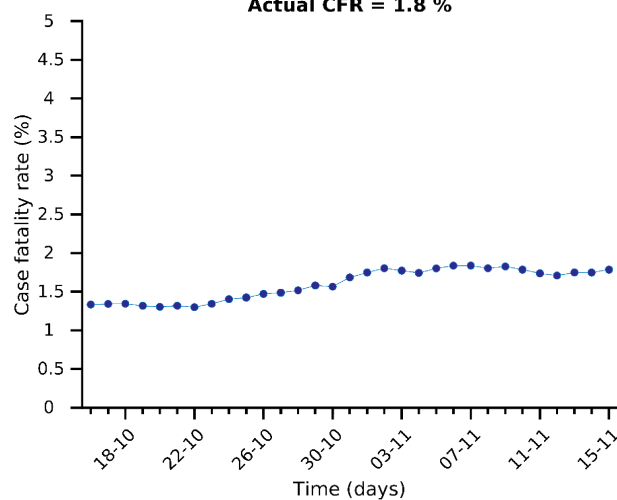
BIOCOM-Cov2 Degree = 7



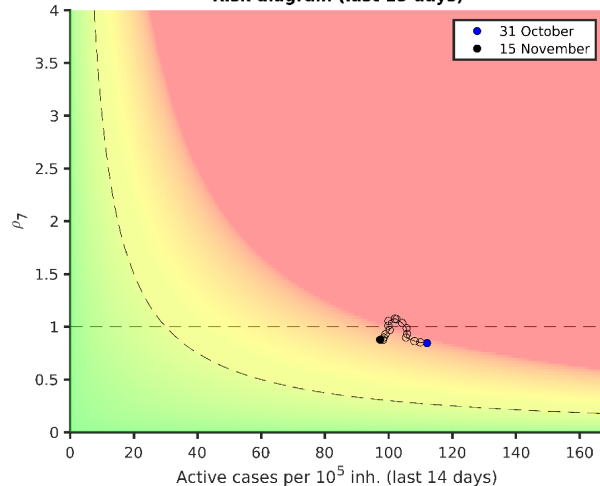
Actual $\rho_7 = 0.9$



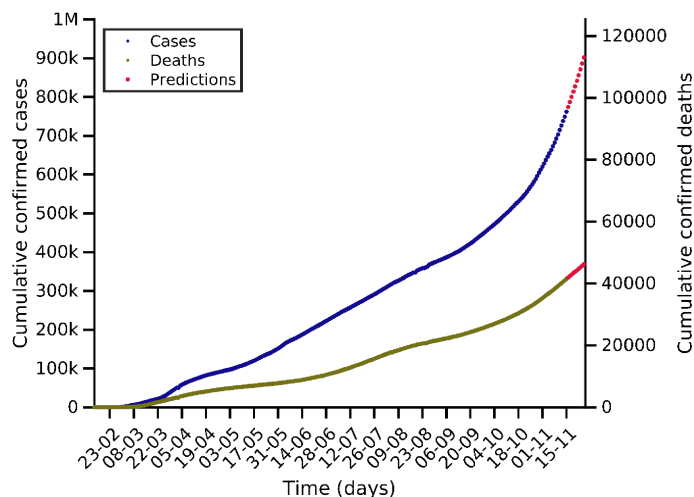
Actual CFR = 1.8 %



Risk diagram (last 15 days)



Iran 15-11-2020. Pop: 84.0M. Cumulative incidence: 907/10⁵

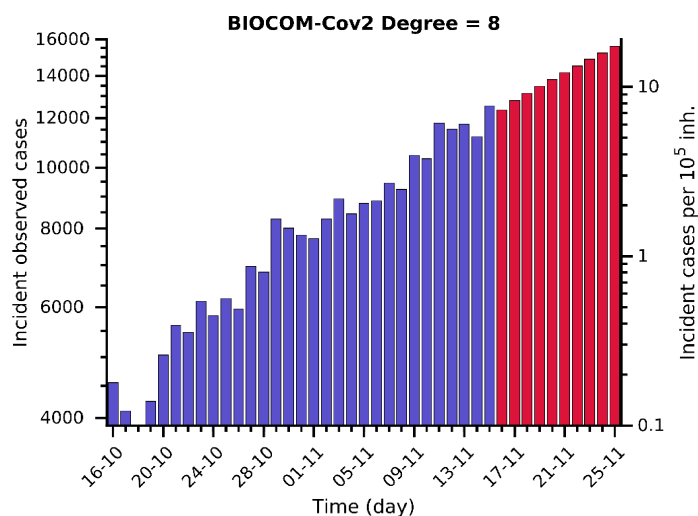
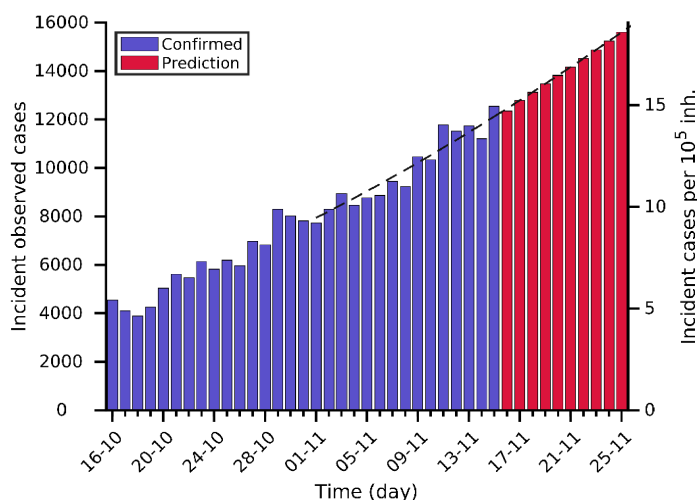


Predictions for next days

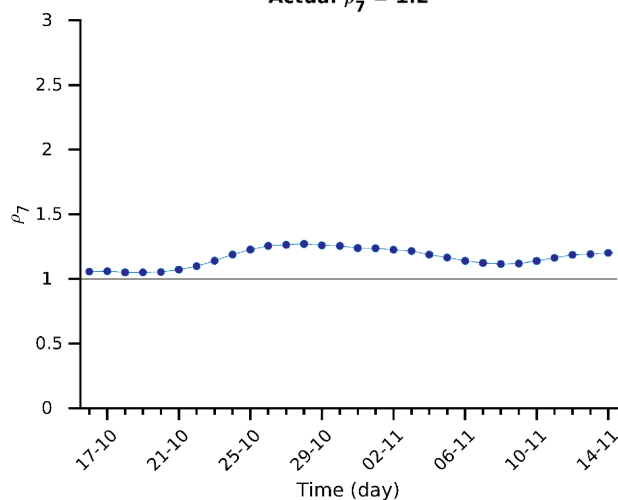
Day	Number of cases	95% Confidence Interval
18-11-2020	800338 (+38270)	[794984 - 805693]
22-11-2020	856315 (+94247)	[842327 - 870303]
25-11-2020	902029 (+139961)	[873342 - 930717]

Current indicators

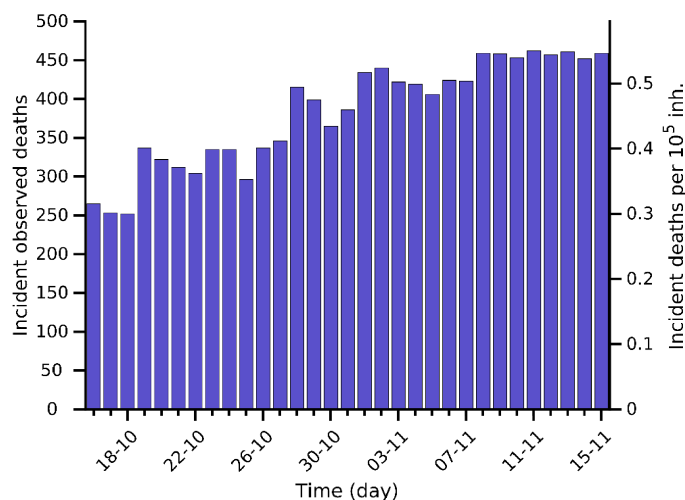
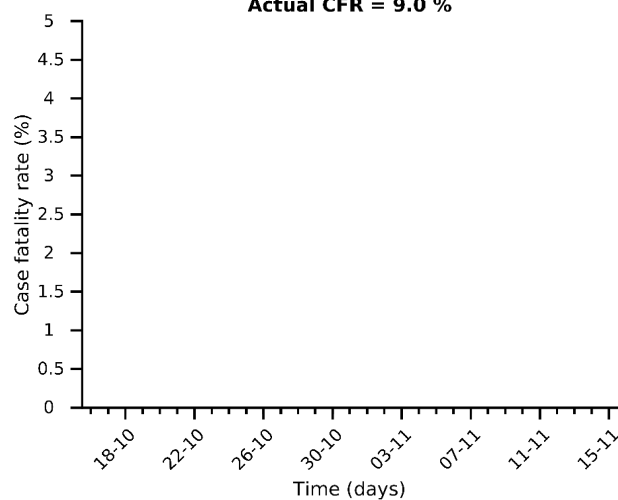
	A14	EPG	CFR	N7	D7
Today	169	203	9.00 %	11369	457
A Week ago	135	152	9.68 %	8856	428
Maximum	169	203	4.99 %	11369	457



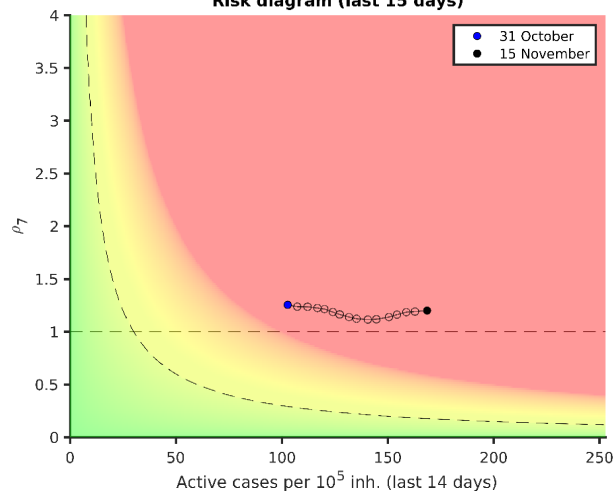
Actual $\rho_7 = 1.2$



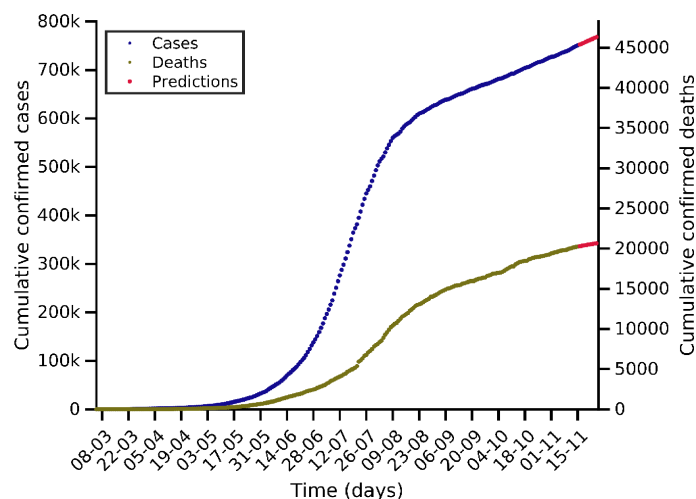
Actual CFR = 9.0 %



Risk diagram (last 15 days)



South Africa 15-11-2020. Pop: 59.3M. Cumulative incidence: 1266/10⁵

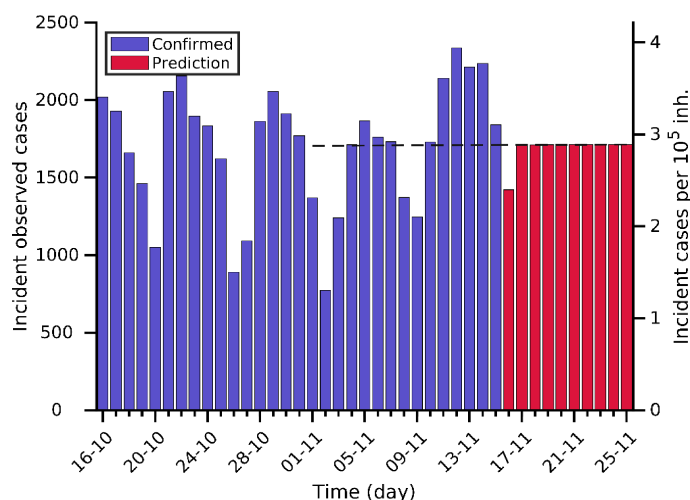


Predictions for next days

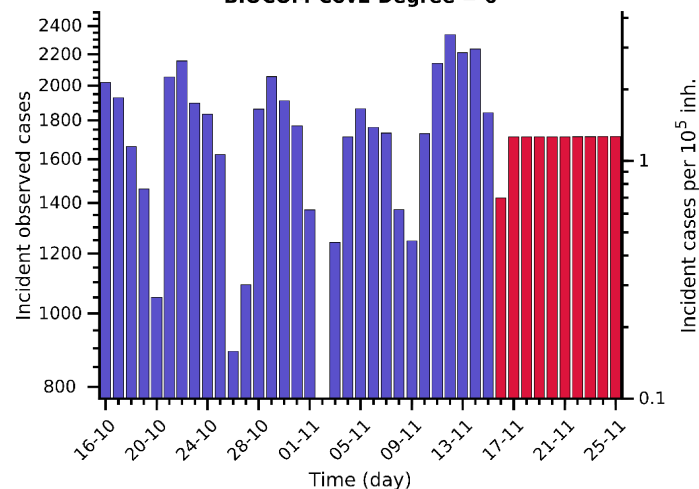
Day	Number of cases	95% Confidence Interval
18-11-2020	755868 (+4844)	[751024 - 763222]
22-11-2020	762716 (+11692)	[751024 - 779991]
25-11-2020	767854 (+16830)	[751024 - 800608]

Current indicators

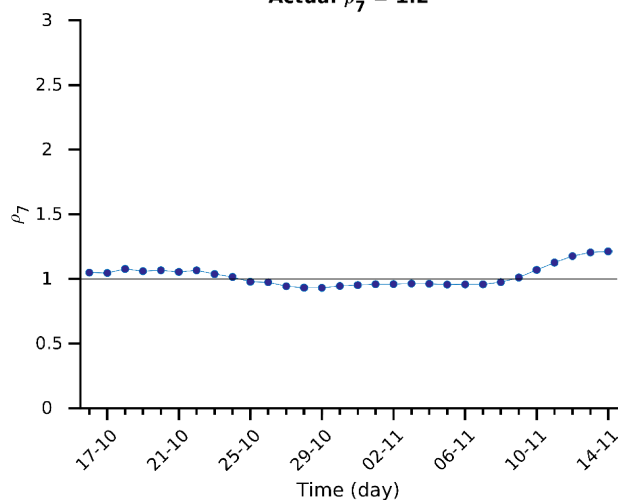
	A14	EPG	CFR	N7	D7
Today	41	49	3.55 %	1964	62
A Week ago	36	35	3.74 %	1494	57
Maximum	289	307	4.99 %	12584	297



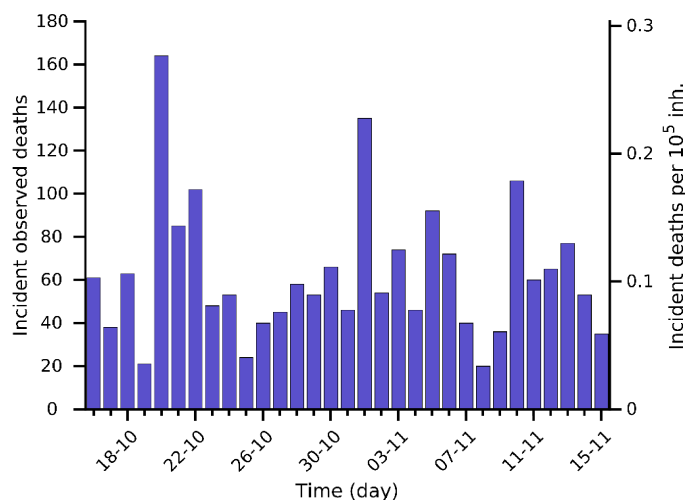
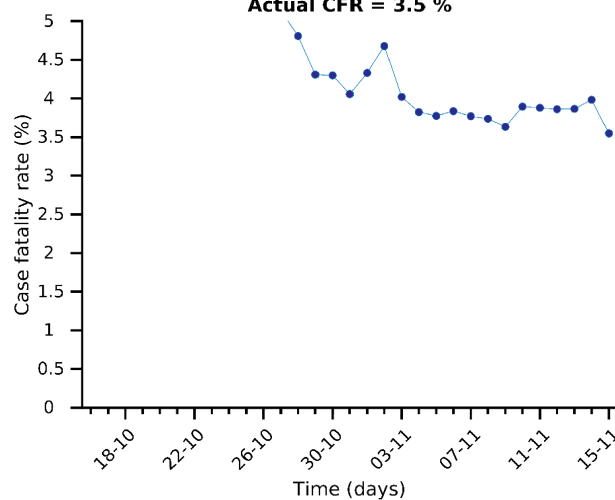
BIOCOM-Cov2 Degree = 6



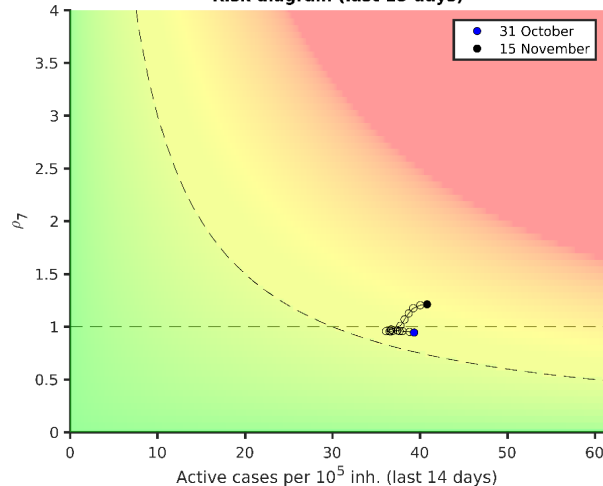
Actual $\rho_7 = 1.2$



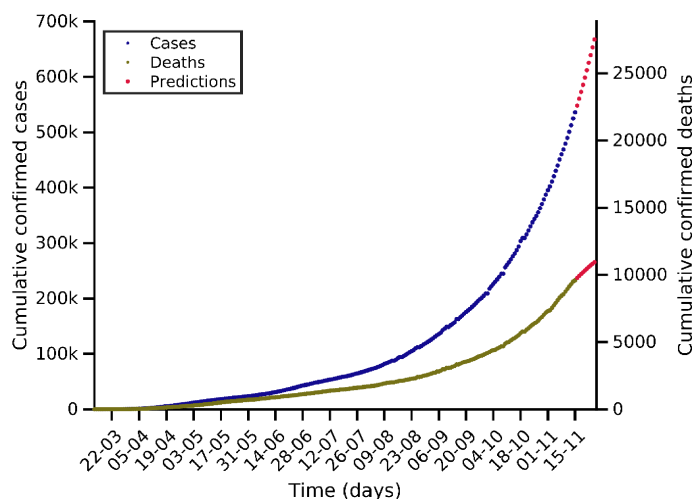
Actual CFR = 3.5 %



Risk diagram (last 15 days)



Ukraine 15-11-2020. Pop: 43.7M. Cumulative incidence: 1225/10⁵

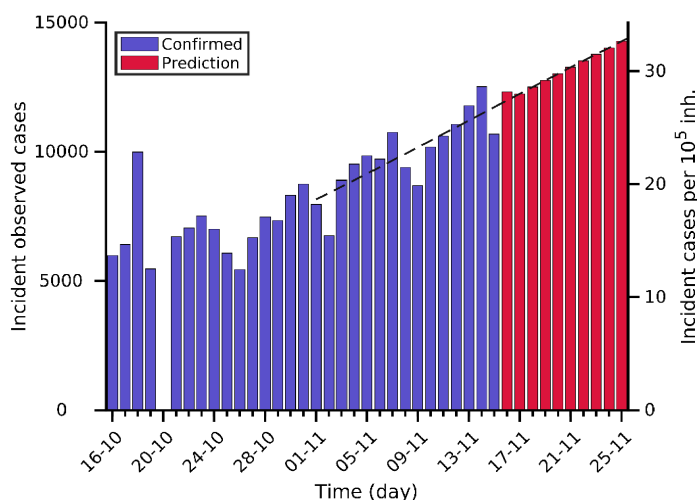


Predictions for next days

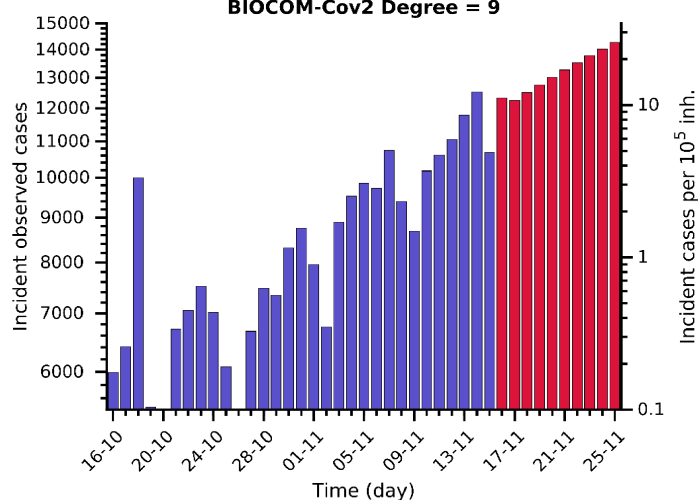
Day	Number of cases	95% Confidence Interval
18-11-2020	572930 (+37073)	[563107 - 582753]
22-11-2020	625499 (+89642)	[600983 - 650015]
25-11-2020	667569 (+131712)	[618488 - 716651]

Current indicators

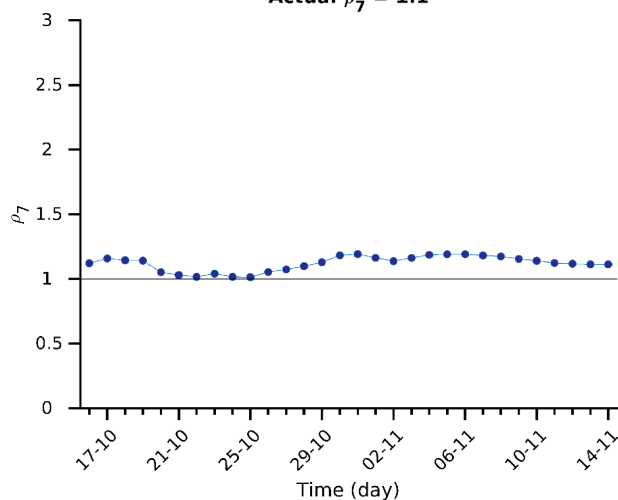
	A14	EPG	CFR	N7	D7
Today	321	357	2.79 %	10789	165
A Week ago	267	316	2.67 %	9270	163
Maximum	321	357	4.96 %	10789	175



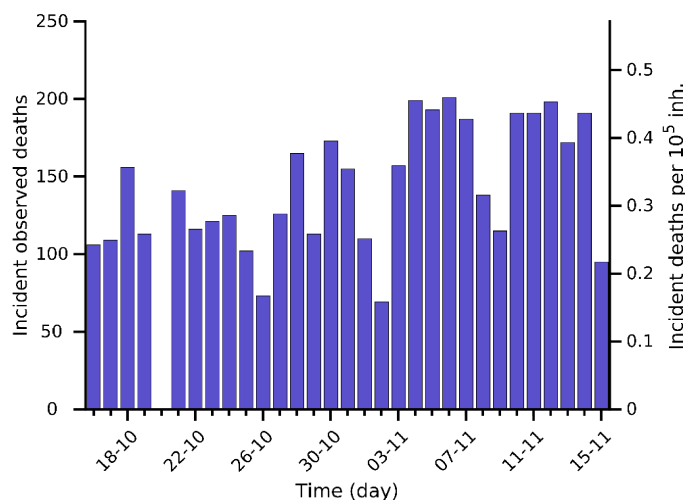
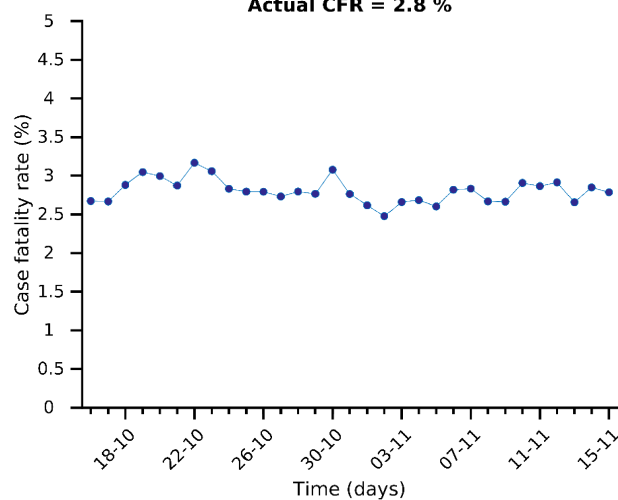
BIOCOM-Cov2 Degree = 9



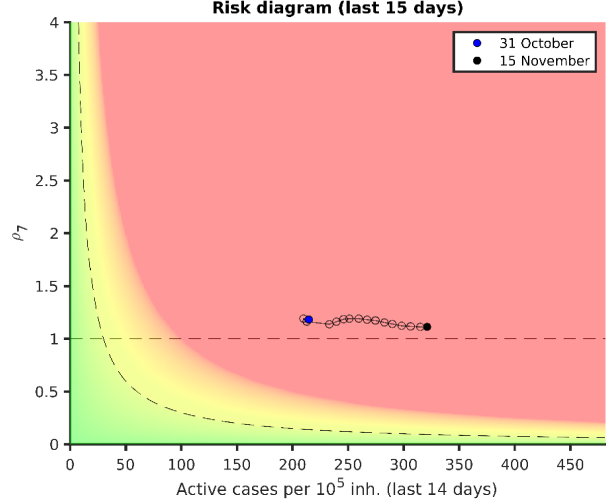
Actual $\rho_7 = 1.1$



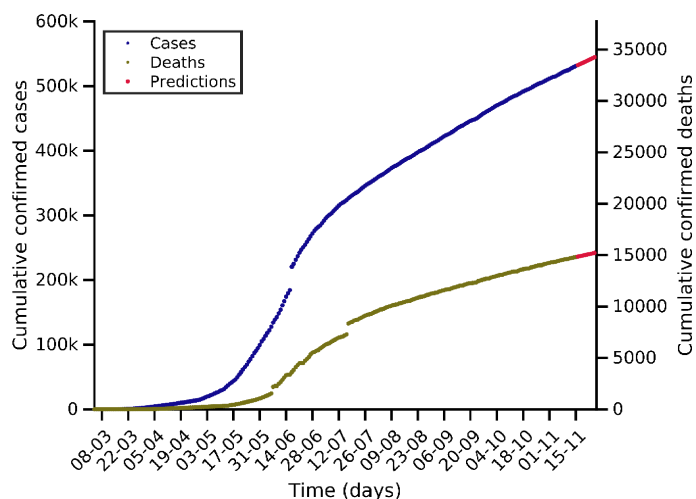
Actual CFR = 2.8 %



Risk diagram (last 15 days)



Chile 15-11-2020. Pop: 19.1M. Cumulative incidence: 2779/10⁵

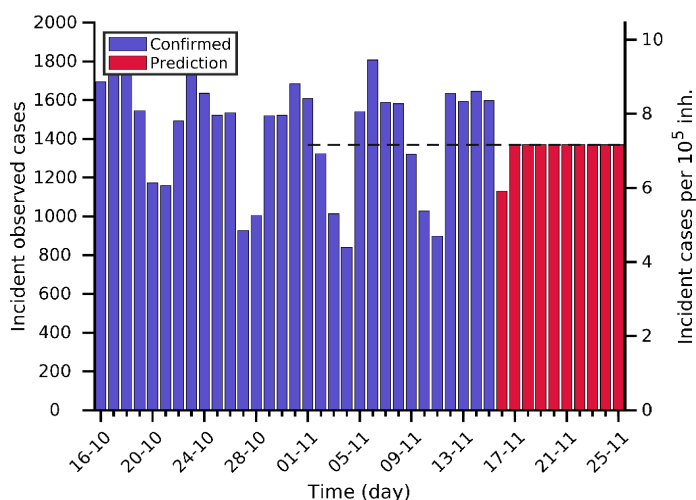


Predictions for next days

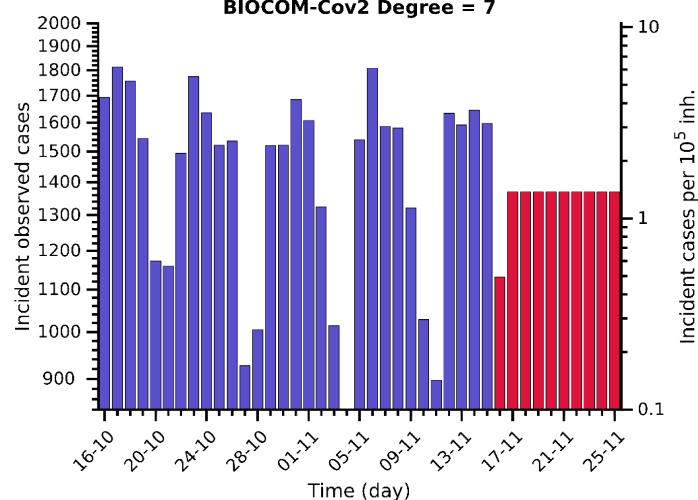
Day	Number of cases	95% Confidence Interval
18-11-2020	535144 (+3871)	[531273 - 539342]
22-11-2020	540622 (+9349)	[531273 - 550671]
25-11-2020	544731 (+13458)	[531273 - 563921]

Current indicators

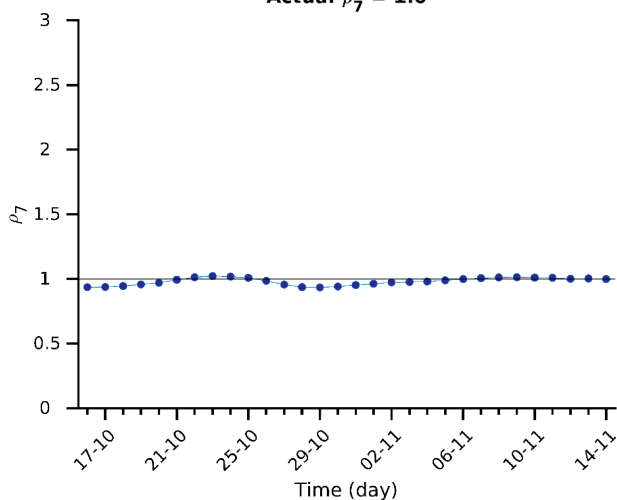
	A14	EPG	CFR	N7	D7
Today	102	101	2.76 %	1388	39
A Week ago	102	103	2.78 %	1385	42
Maximum	570	1031	4.98 %	10305	230



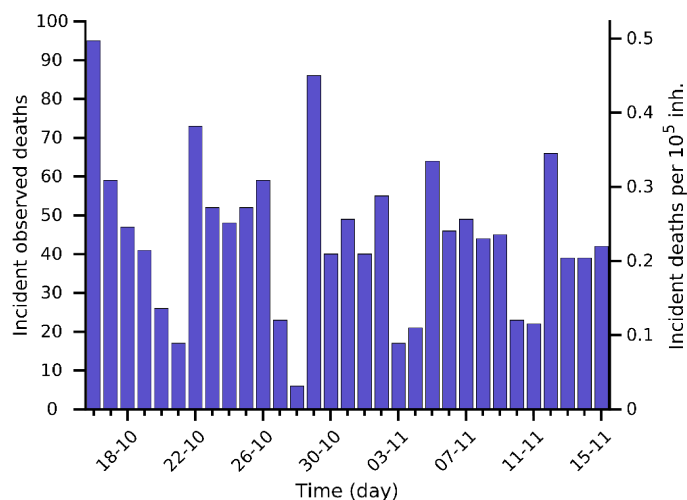
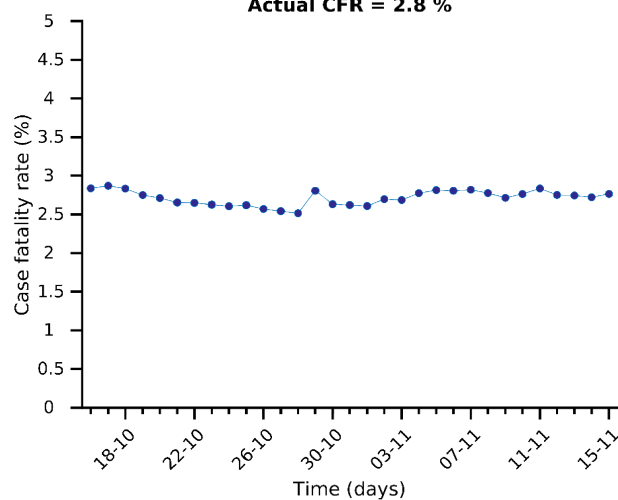
BIOCOM-Cov2 Degree = 7



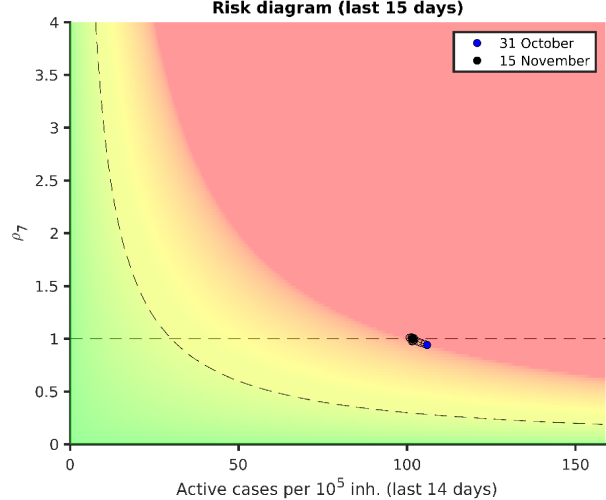
Actual $\rho_7 = 1.0$



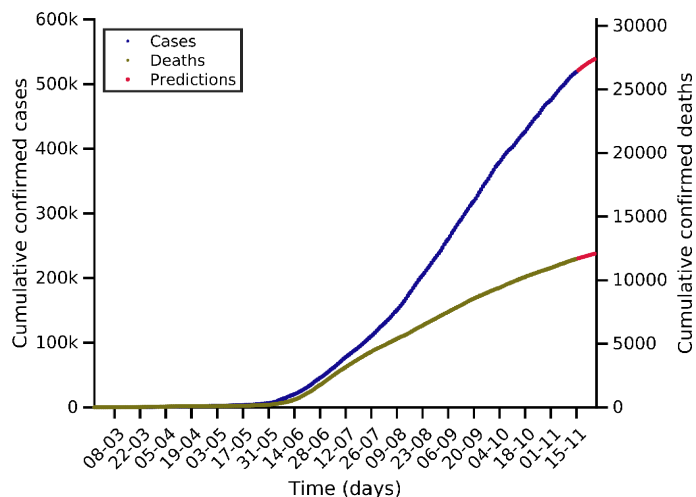
Actual CFR = 2.8 %



Risk diagram (last 15 days)



Iraq 15-11-2020. Pop: 40.2M. Cumulative incidence: 1291/10⁵

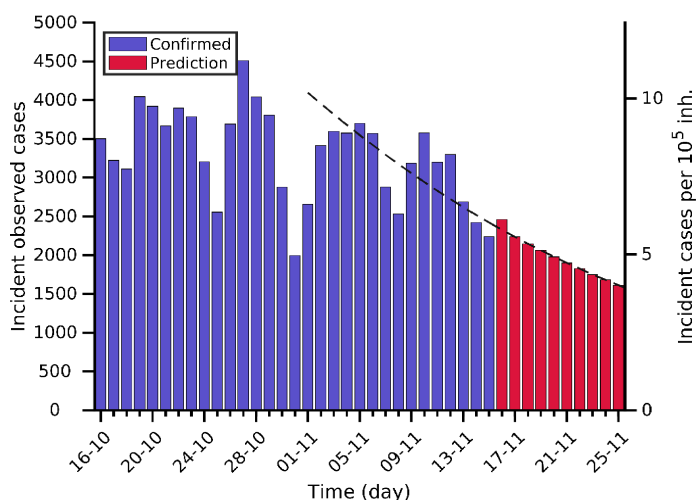


Predictions for next days

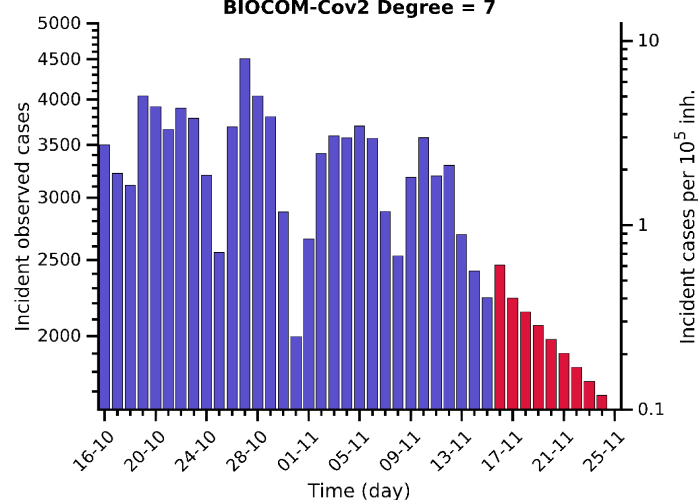
Day	Number of cases	95% Confidence Interval
18-11-2020	525996 (+6844)	[522369 - 529622]
22-11-2020	533763 (+14611)	[527760 - 539767]
25-11-2020	538807 (+19655)	[529387 - 548227]

Current indicators

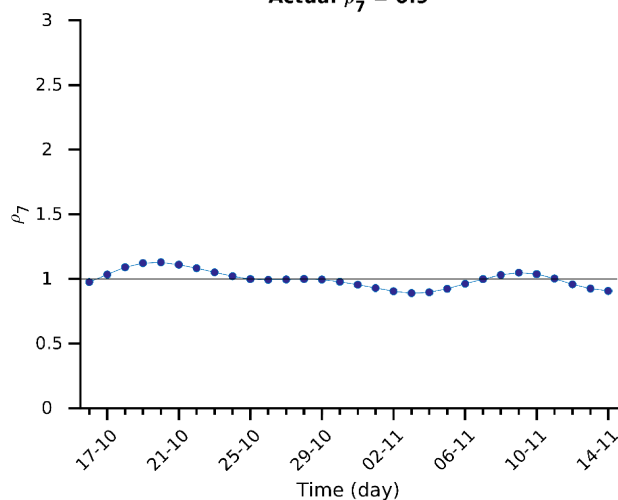
	A14	EPG	CFR	N7	D7
Today	109	99	1.43 %	2943	49
A Week ago	116	116	1.48 %	3323	52
Maximum	151	162	4.96 %	4505	106



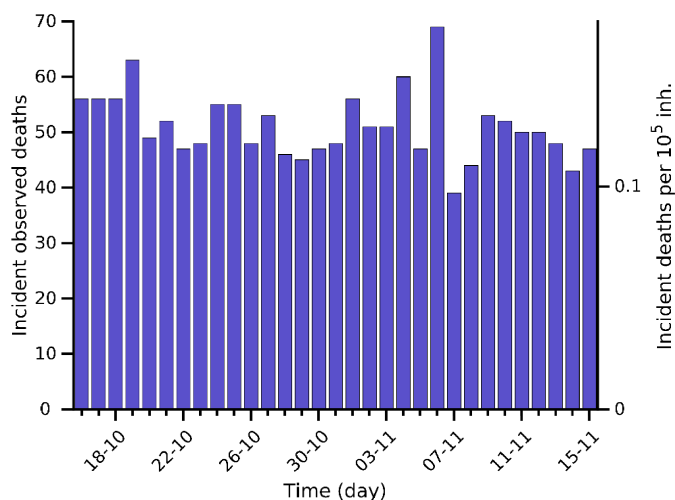
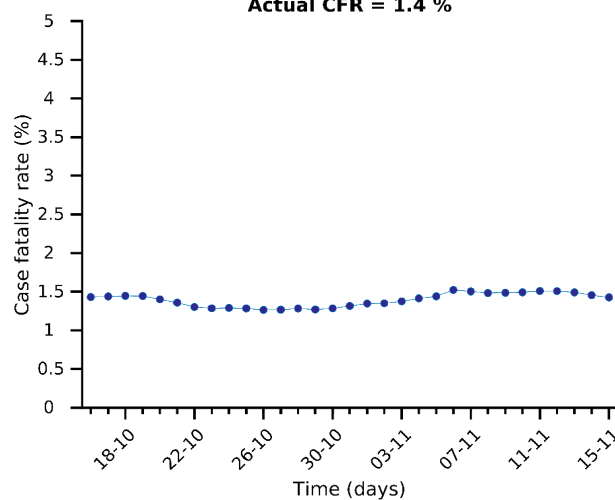
BIOCOM-Cov2 Degree = 7



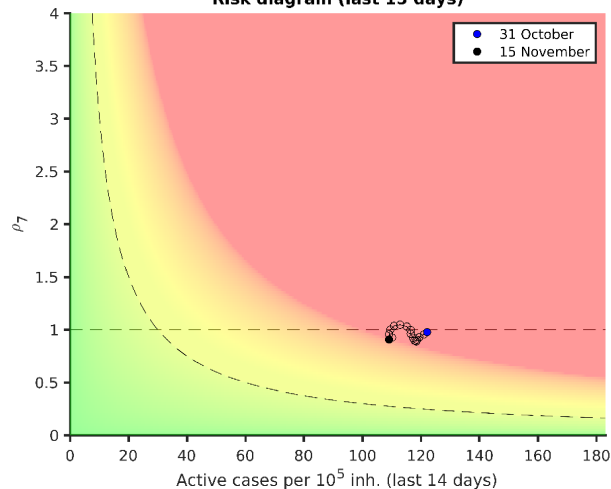
Actual $\rho_7 = 0.9$



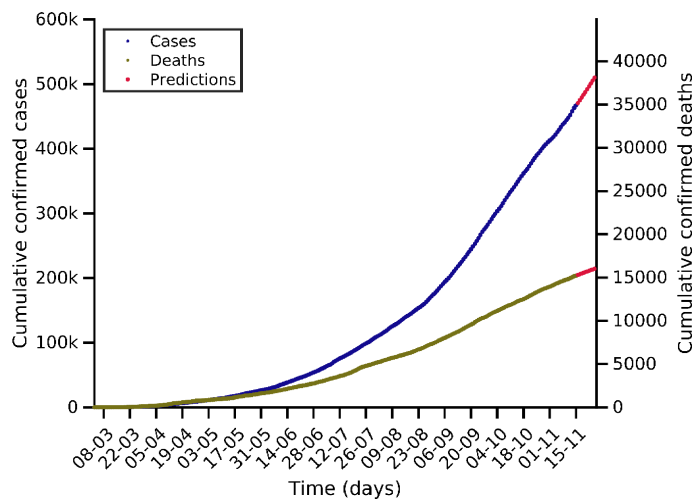
Actual CFR = 1.4 %



Risk diagram (last 15 days)



Indonesia 15-11-2020. Pop: 273.5M. Cumulative incidence: 171/10⁵

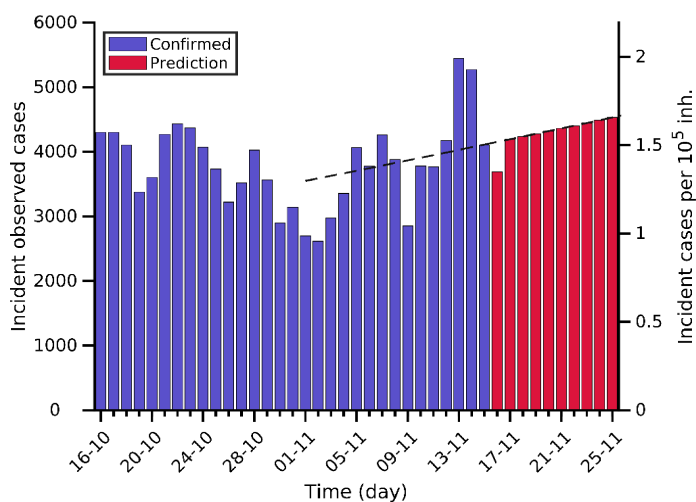


Predictions for next days

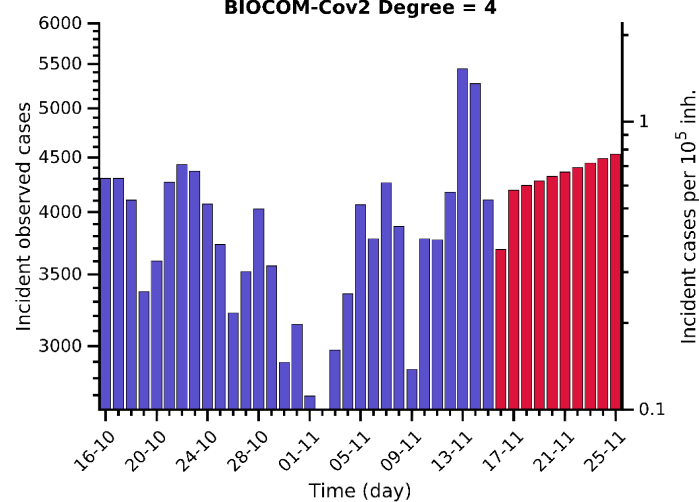
Day	Number of cases	95% Confidence Interval
18-11-2020	479235 (+12122)	[467188 - 491281]
22-11-2020	496596 (+29483)	[467844 - 525349]
25-11-2020	510060 (+42947)	[467113 - 566574]

Current indicators

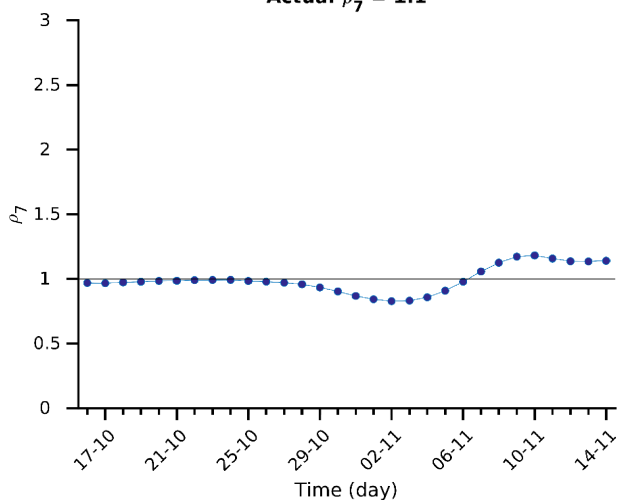
	A14	EPG	CFR	N7	D7
Today	20	23	2.25 %	4200	85
A Week ago	18	19	2.25 %	3562	96
Maximum	22	23	4.98 %	4379	126



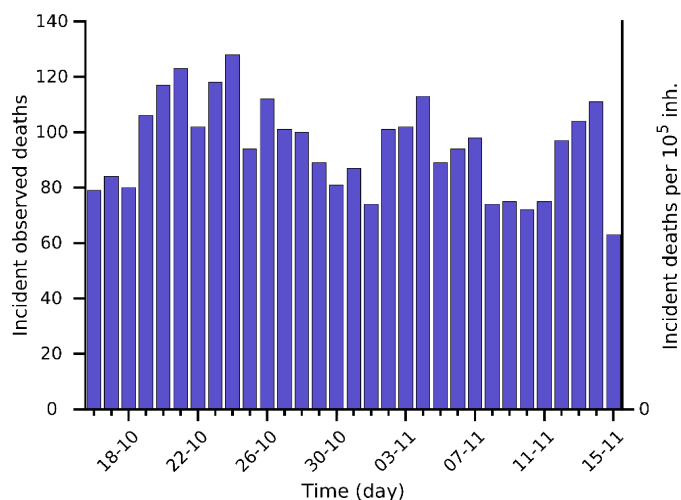
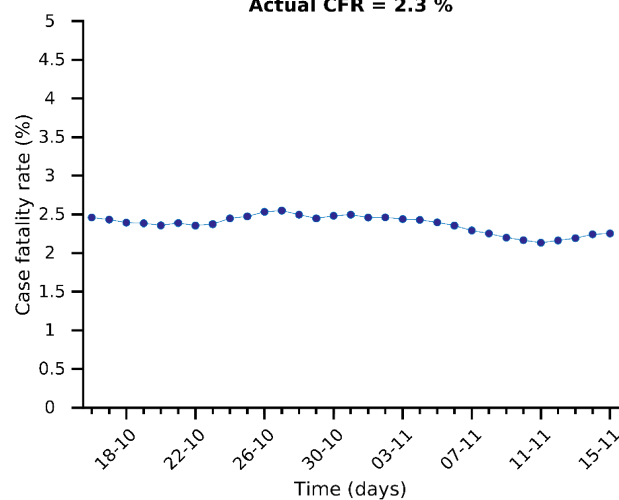
BIOCOM-Cov2 Degree = 4



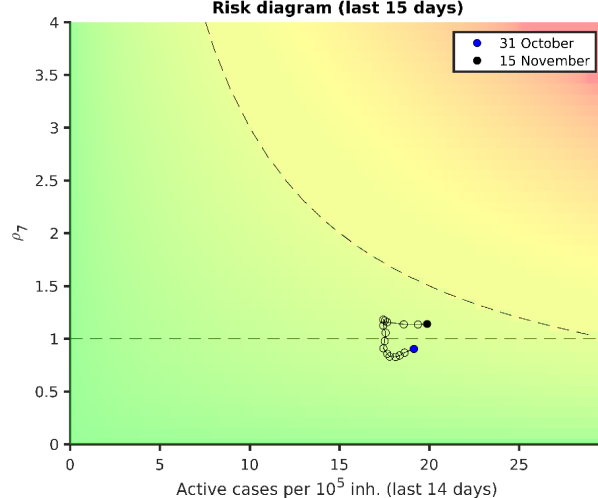
Actual $\rho_7 = 1.1$



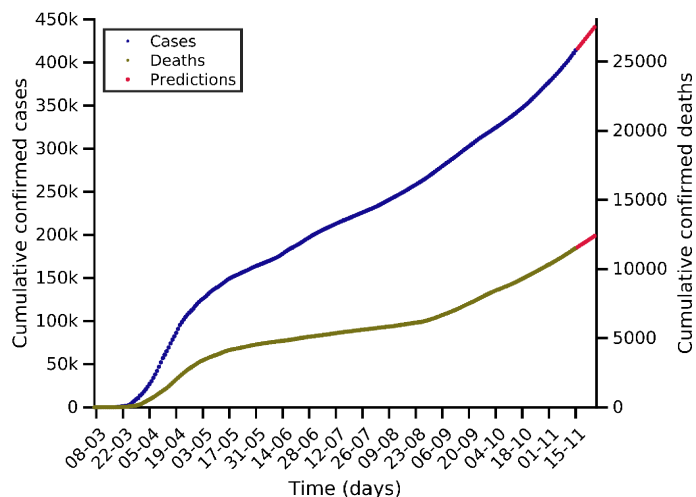
Actual CFR = 2.3 %



Risk diagram (last 15 days)



Turkey 15-11-2020. Pop: 84.3M. Cumulative incidence: 491/10⁵

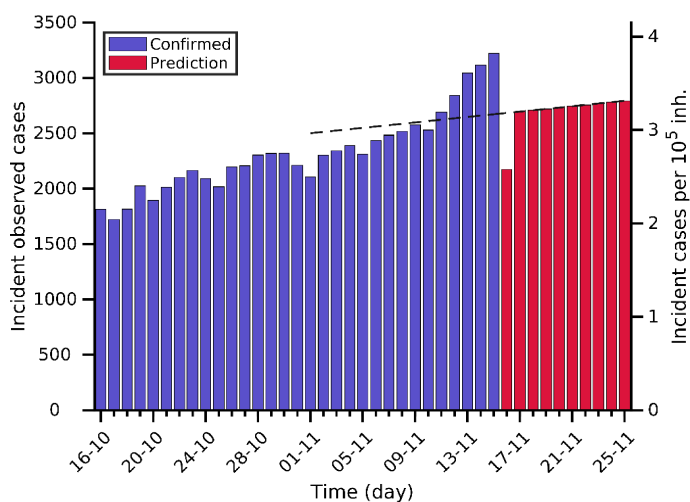


Predictions for next days

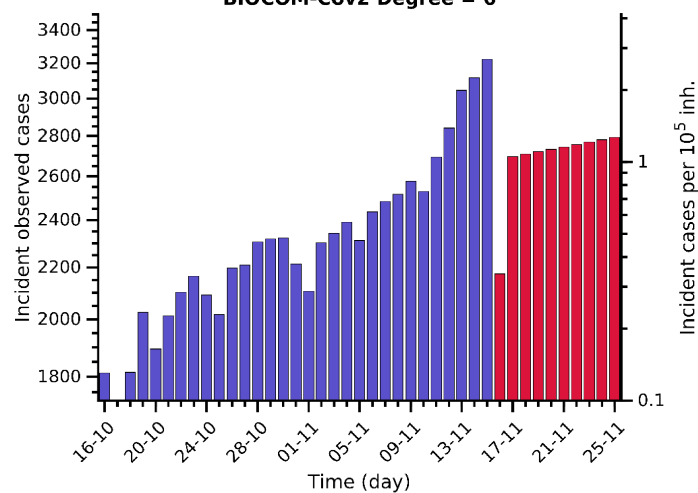
Day	Number of cases	95% Confidence Interval
18-11-2020	421857 (+7579)	[414278 - 429961]
22-11-2020	432812 (+18534)	[414278 - 451635]
25-11-2020	441155 (+26877)	[414278 - 477600]

Current indicators

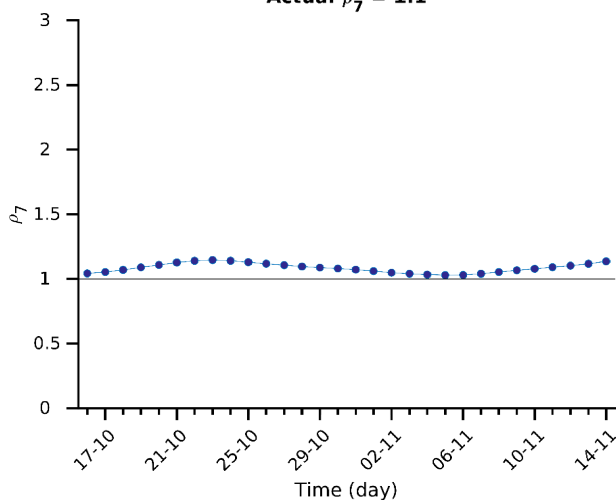
	A14	EPG	CFR	N7	D7
Today	44	50	4.50 %	2860	89
A Week ago	38	40	4.72 %	2397	80
Maximum	73	85	4.93 %	4559	123



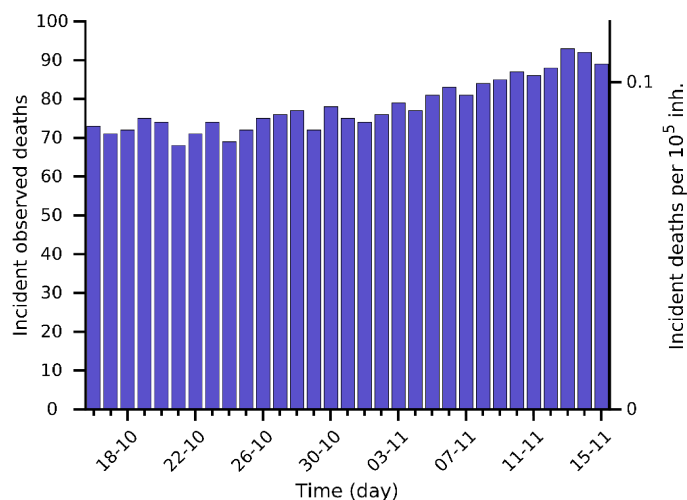
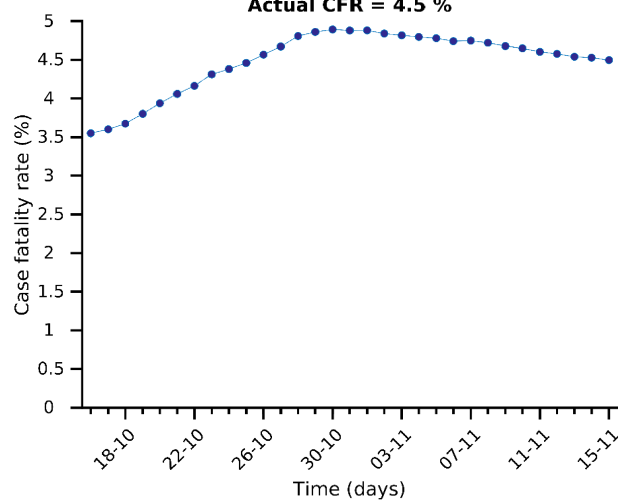
BIOCOM-Cov2 Degree = 6



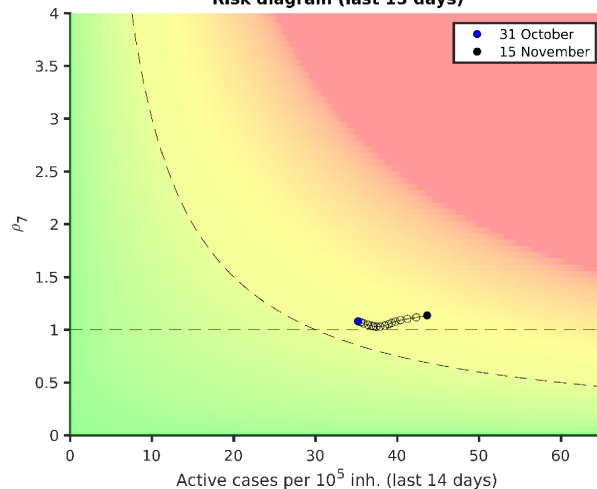
Actual $\rho_7 = 1.1$



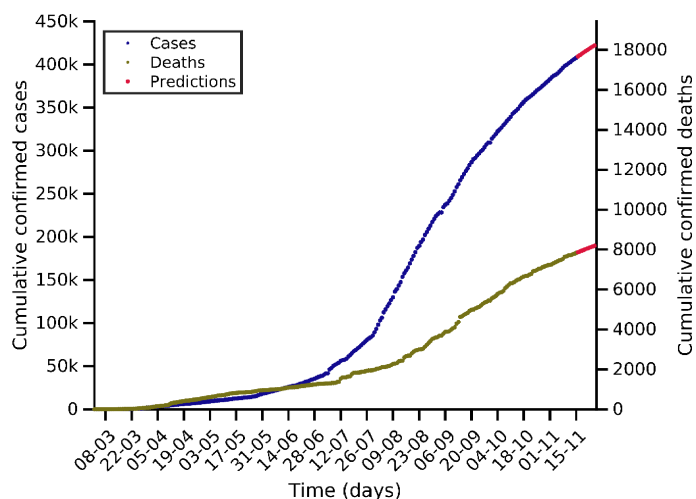
Actual CFR = 4.5 %



Risk diagram (last 15 days)



Philippines 15-11-2020. Pop: 109.6M. Cumulative incidence: 372/10⁵

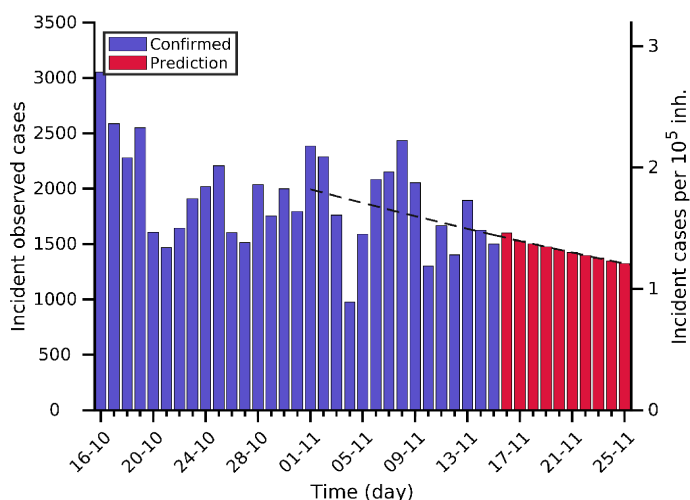


Predictions for next days

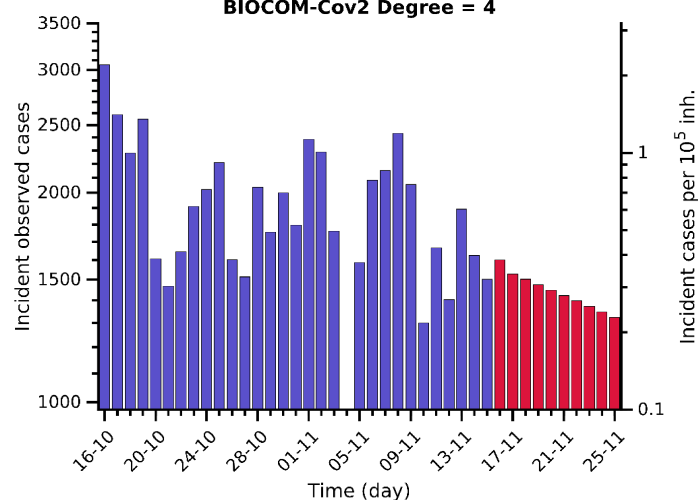
Day	Number of cases	95% Confidence Interval
18-11-2020	412468 (+4630)	[410594 - 414341]
22-11-2020	418213 (+10375)	[414584 - 421841]
25-11-2020	422257 (+14419)	[415918 - 428596]

Current indicators

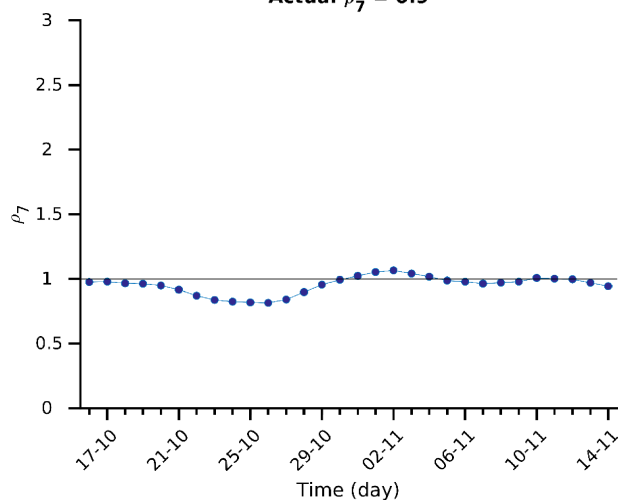
	A14	EPG	CFR	N7	D7
Today	23	21	1.94 %	1635	42
A Week ago	24	23	1.65 %	1897	43
Maximum	55	74	4.92 %	4477	107



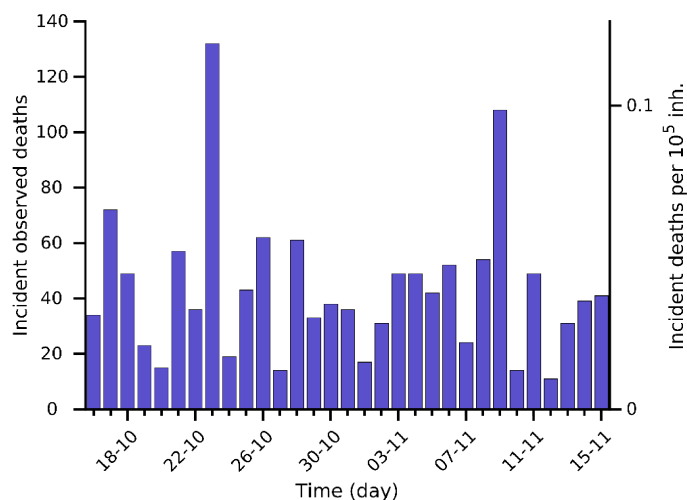
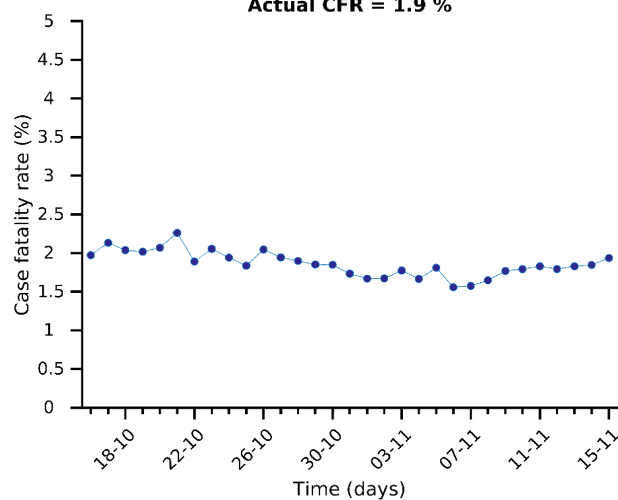
BIOCOM-Cov2 Degree = 4



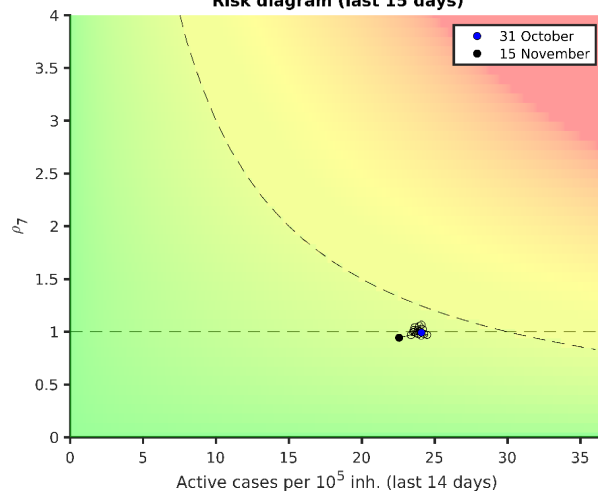
Actual $\rho_7 = 0.9$



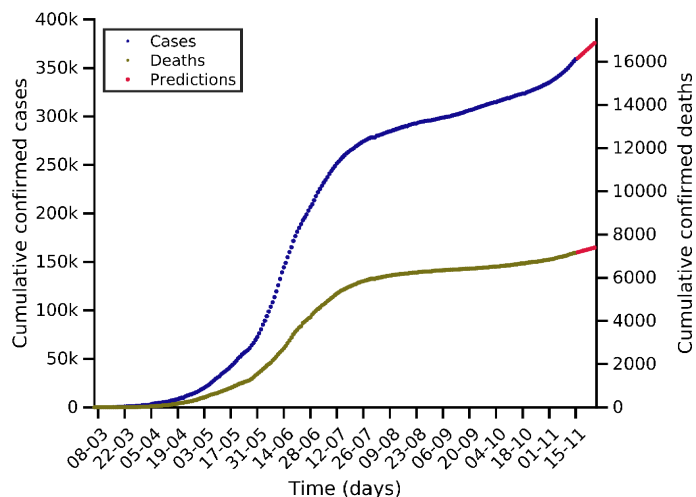
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Pakistan 15-11-2020. Pop: 220.9M. Cumulative incidence: 163/10⁵

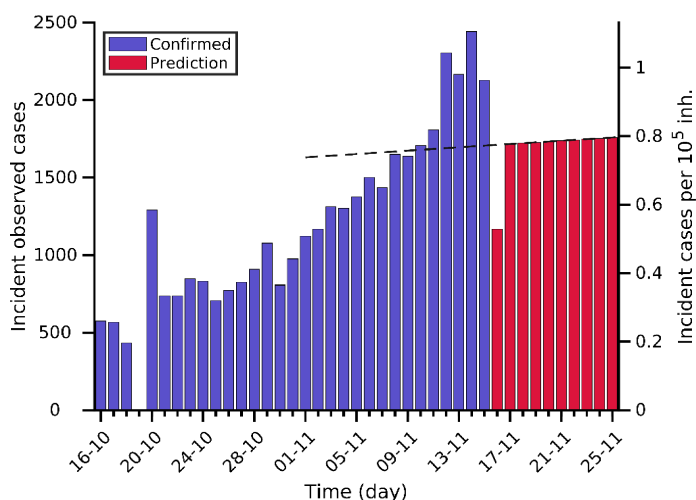


Predictions for next days

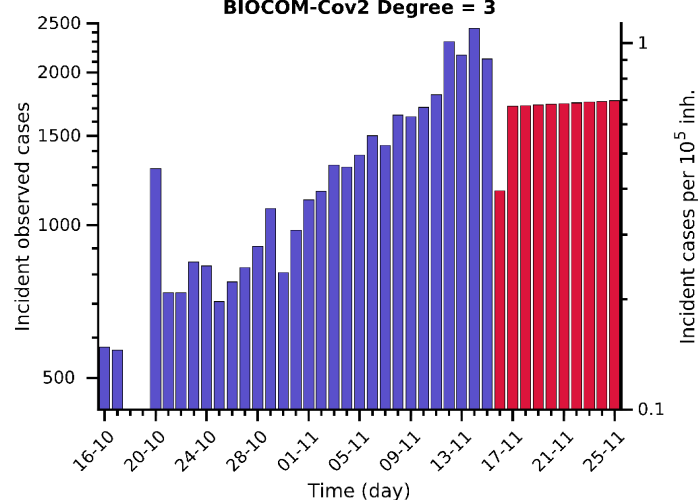
Day	Number of cases	95% Confidence Interval
18-11-2020	363640 (+4608)	[359032 - 373807]
22-11-2020	370581 (+11549)	[359032 - 394162]
25-11-2020	375843 (+16811)	[359032 - 421350]

Current indicators

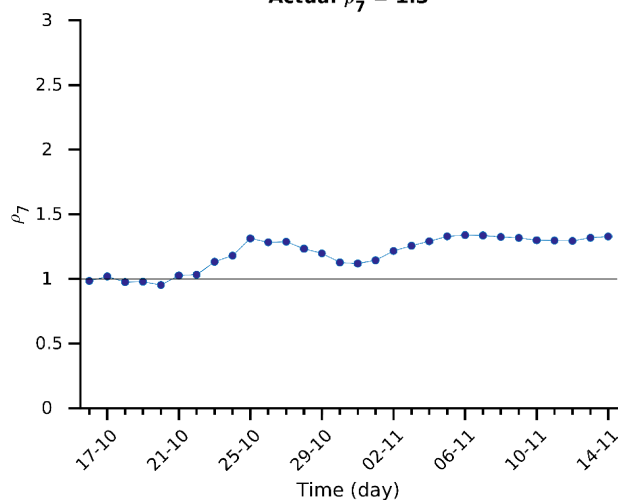
	A14	EPG	CFR	N7	D7
Today	11	14	3.36 %	2028	26
A Week ago	7	10	2.69 %	1392	20
Maximum	35	40	4.90 %	5865	124



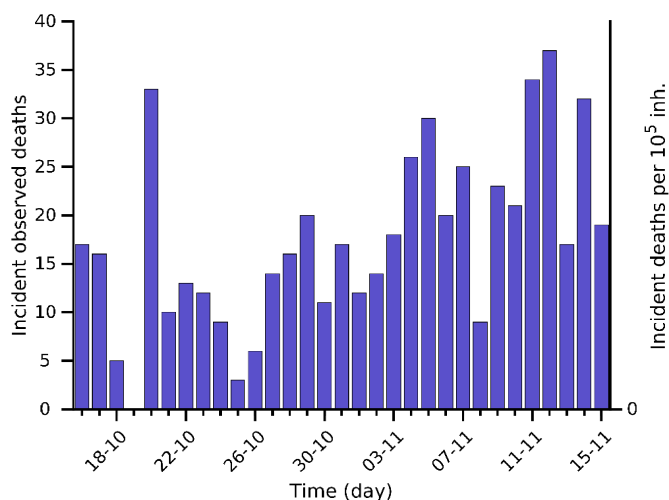
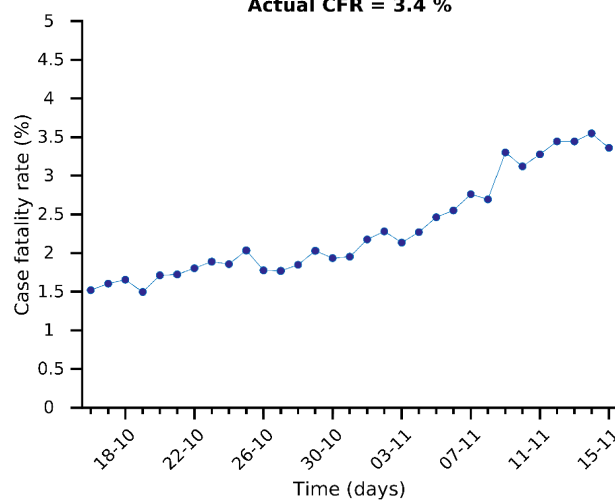
BIOCOM-Cov2 Degree = 3



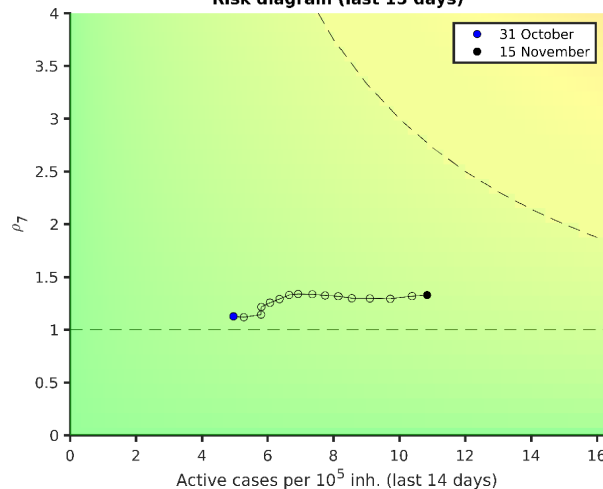
Actual $\rho_7 = 1.3$



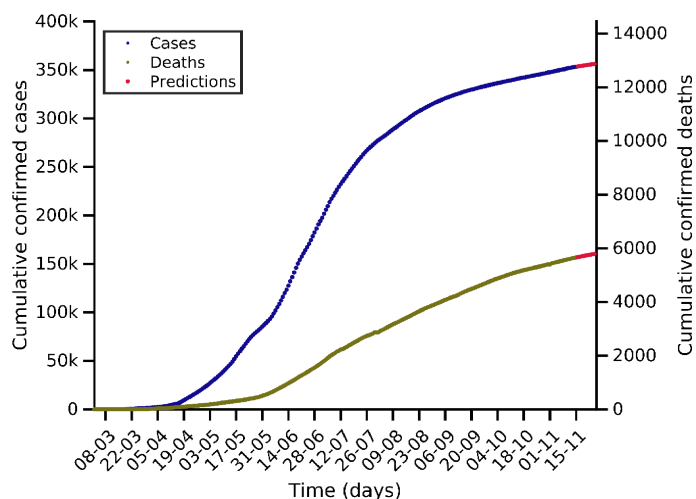
Actual CFR = 3.4 %



Risk diagram (last 15 days)



Saudi Arabia 15-11-2020. Pop: 34.8M. Cumulative incidence: 1015/10⁵

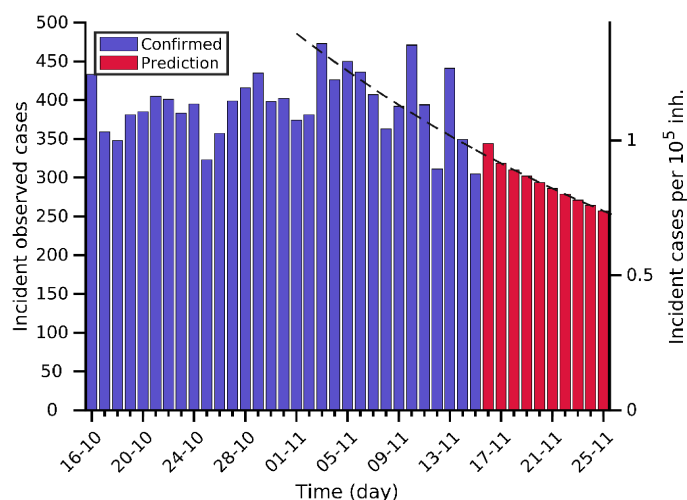


Predictions for next days

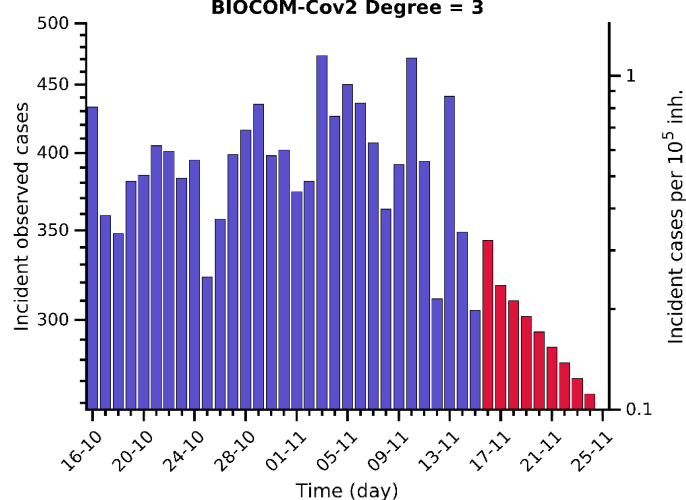
Day	Number of cases	95% Confidence Interval
18-11-2020	354227 (+972)	[353857 - 354598]
22-11-2020	355388 (+2133)	[354928 - 355847]
25-11-2020	356180 (+2925)	[355601 - 356759]

Current indicators

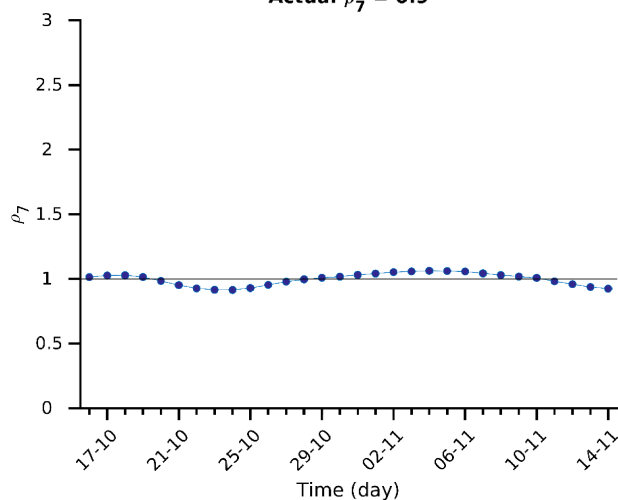
	A14	EPG	CFR	N7	D7
Today	16	15	4.55 %	380	17
A Week ago	16	17	4.20 %	419	20
Maximum	160	189	4.97 %	4418	53



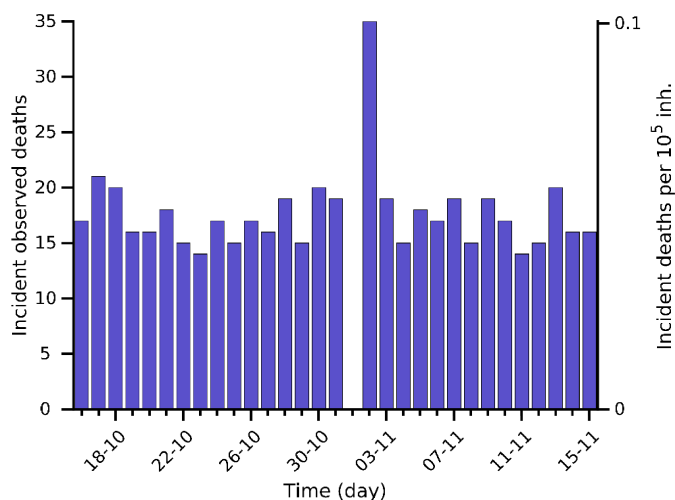
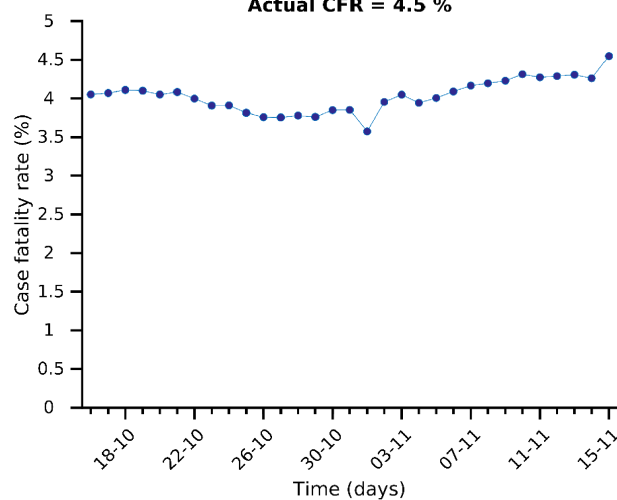
BIOCOM-Cov2 Degree = 3



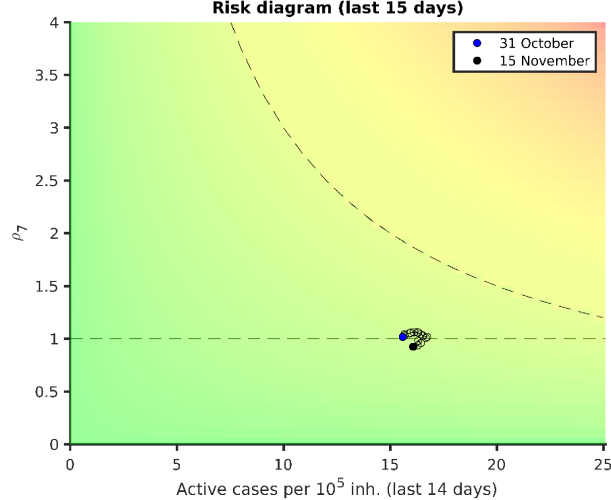
Actual $\rho_7 = 0.9$



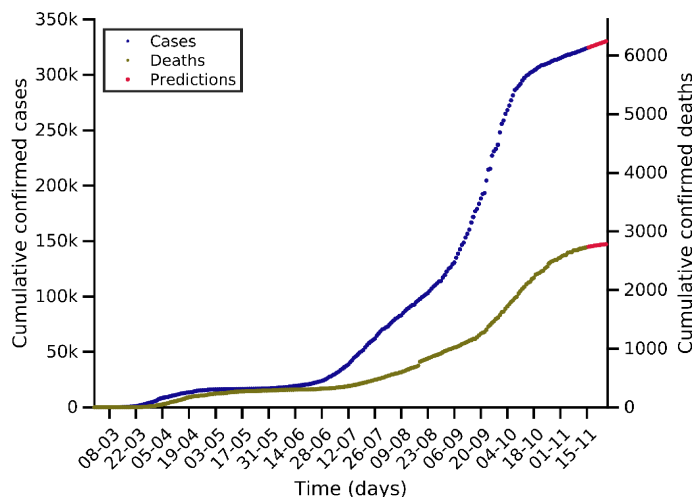
Actual CFR = 4.5 %



Risk diagram (last 15 days)



Israel 15-11-2020. Pop: 8.7M. Cumulative incidence: 3745/10⁵

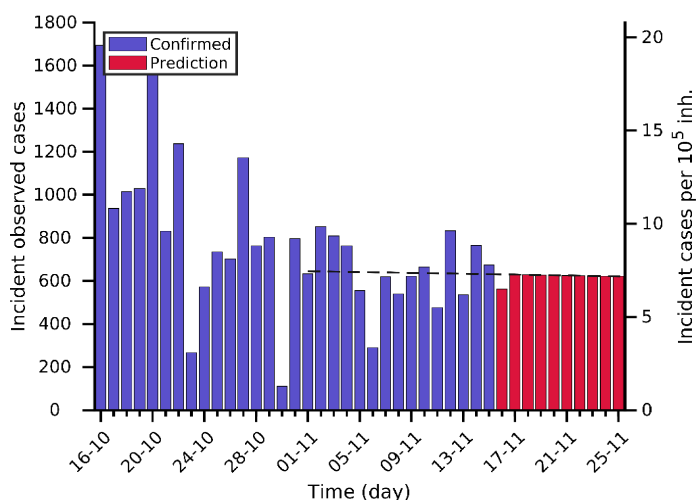


Predictions for next days

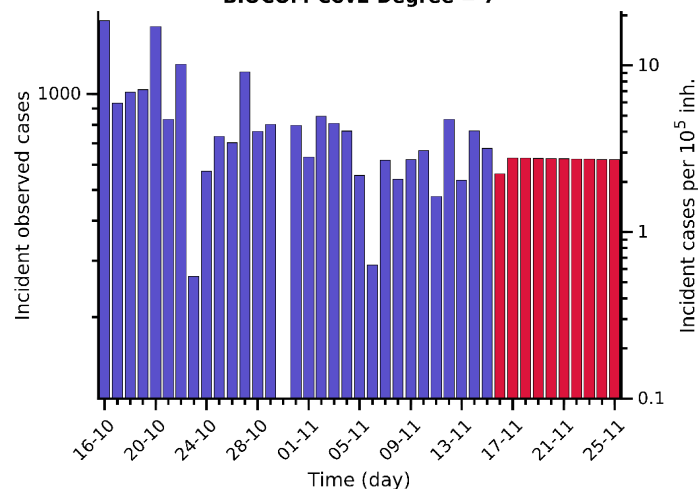
Day	Number of cases	95% Confidence Interval
18-11-2020	325956 (+1821)	[324439 - 327473]
22-11-2020	328461 (+4326)	[326214 - 330708]
25-11-2020	330329 (+6194)	[326917 - 333742]

Current indicators

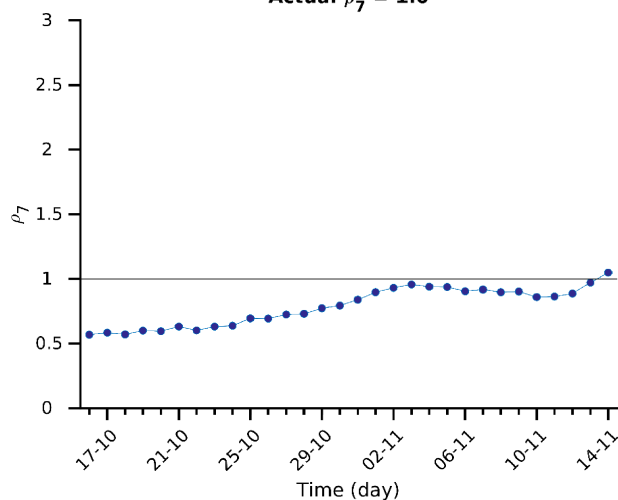
	A14	EPG	CFR	N7	D7
Today	104	109	0.97 %	653	8
A Week ago	109	100	0.78 %	633	17
Maximum	966	1164	4.99 %	6233	39



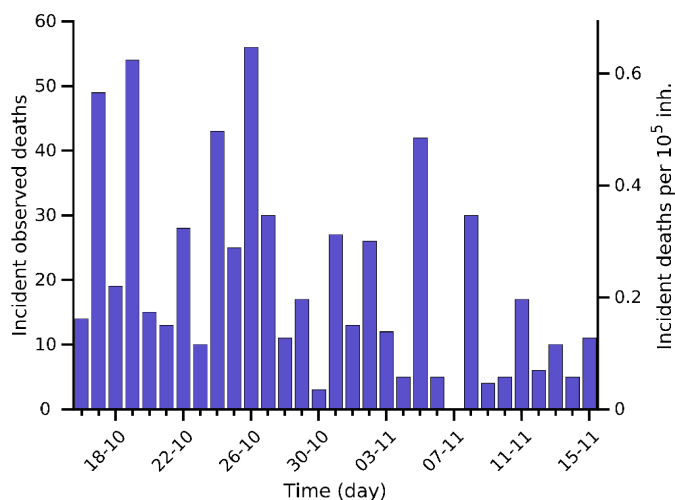
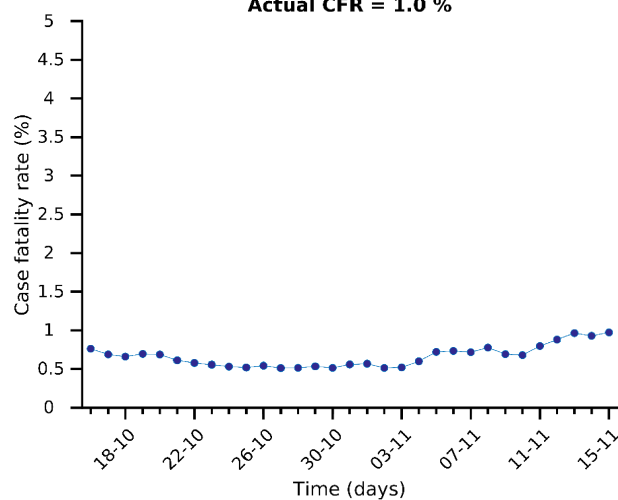
BIOCOM-Cov2 Degree = 7



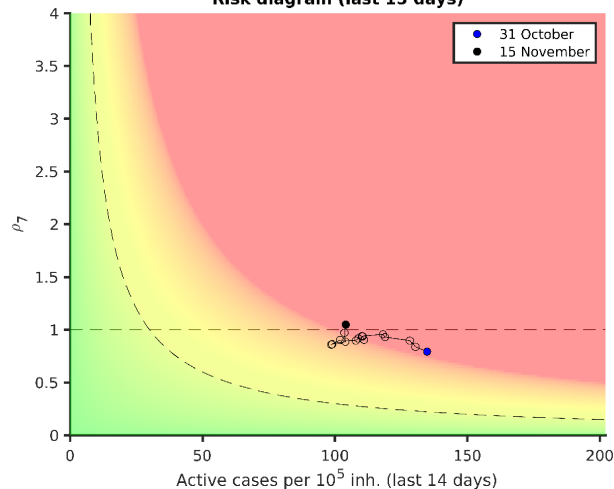
Actual $\rho_7 = 1.0$



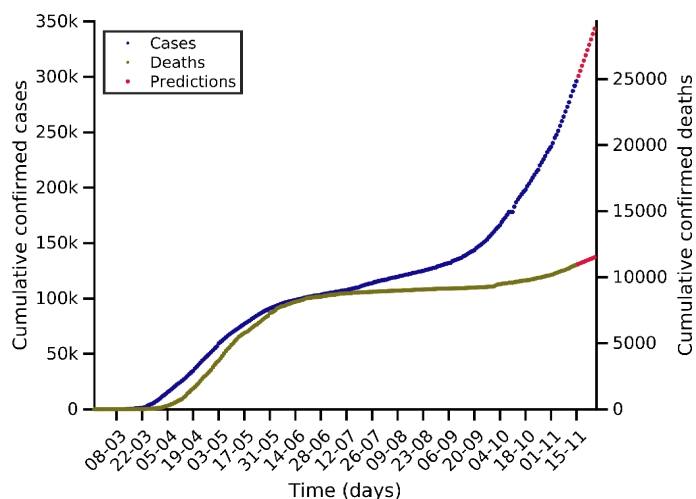
Actual CFR = 1.0 %



Risk diagram (last 15 days)



Canada 15-11-2020. Pop: 37.7M. Cumulative incidence: 784/10⁵

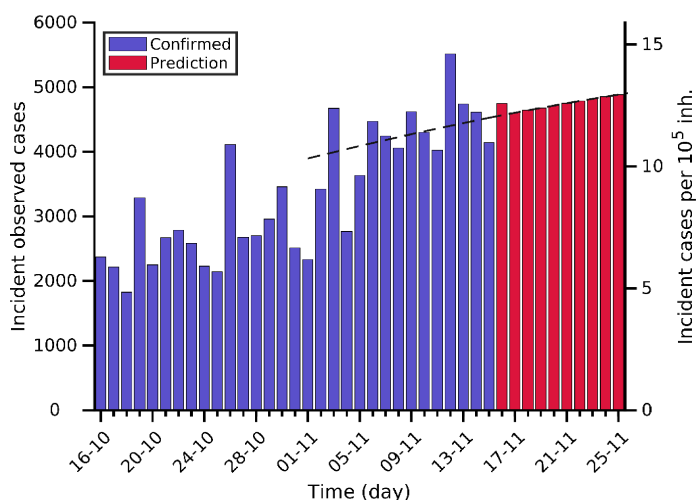


Predictions for next days

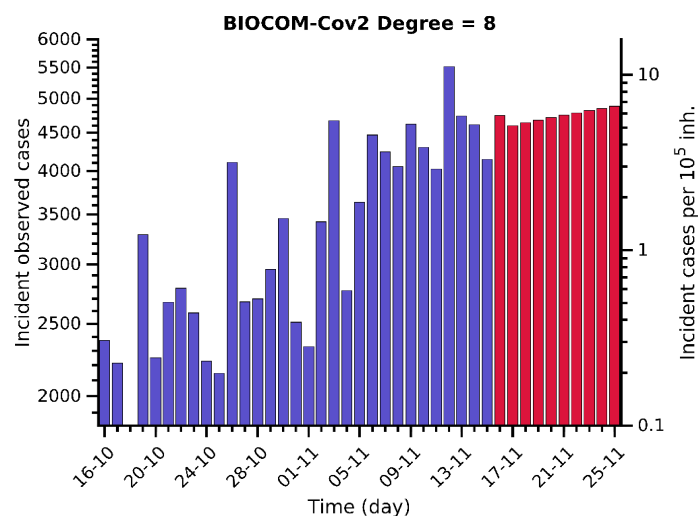
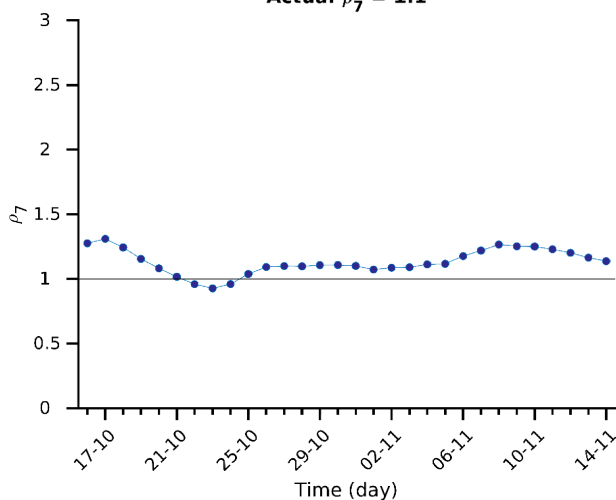
Day	Number of cases	95% Confidence Interval
18-11-2020	310070 (+13993)	[305350 - 314789]
22-11-2020	329000 (+32923)	[318101 - 339899]
25-11-2020	343556 (+47479)	[322536 - 364577]

Current indicators

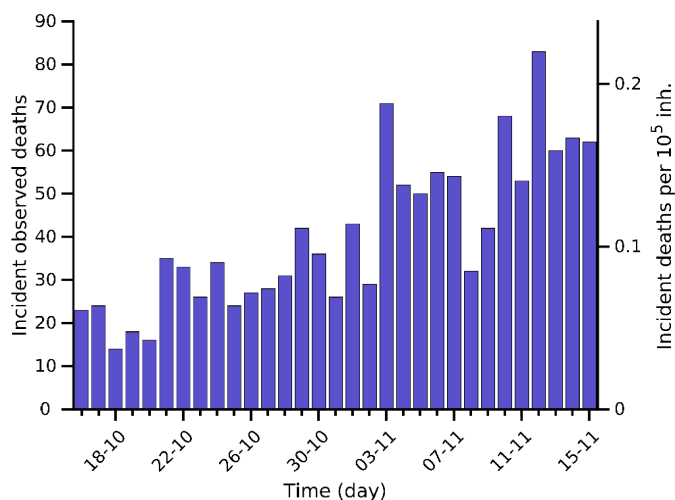
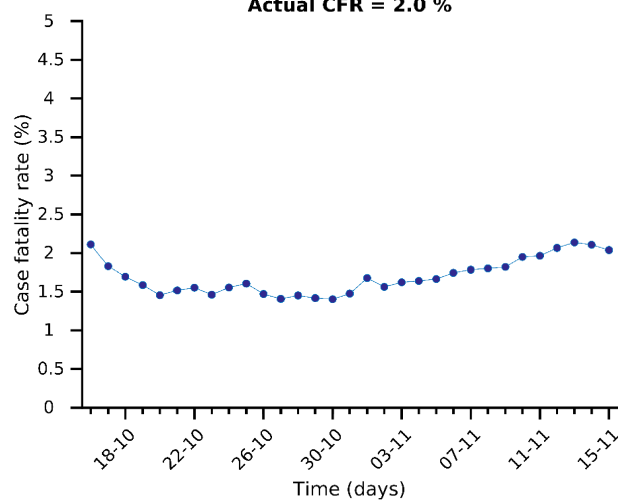
	A14	EPG	CFR	N7	D7
Today	157	178	2.04 %	4566	62
A Week ago	127	155	1.80 %	3896	49
Maximum	157	178	4.96 %	4566	177



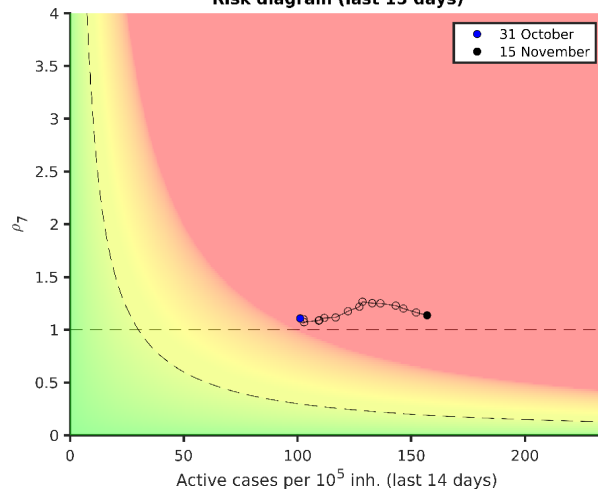
Actual $\rho_7 = 1.1$



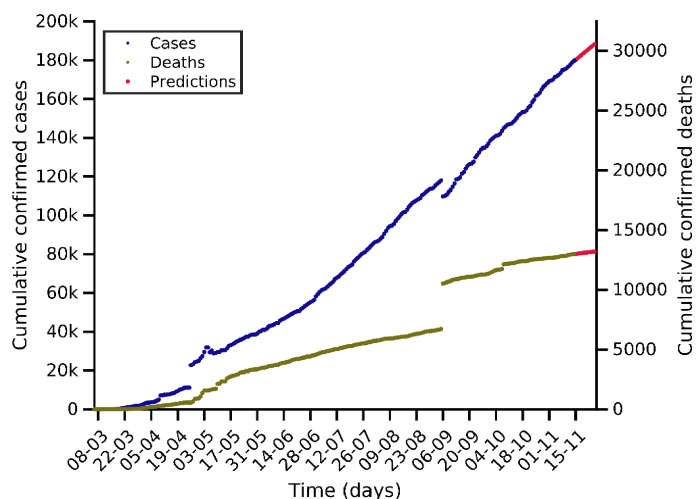
Actual CFR = 2.0 %



Risk diagram (last 15 days)



Ecuador 15-11-2020. Pop: 17.6M. Cumulative incidence: 1022/10⁵

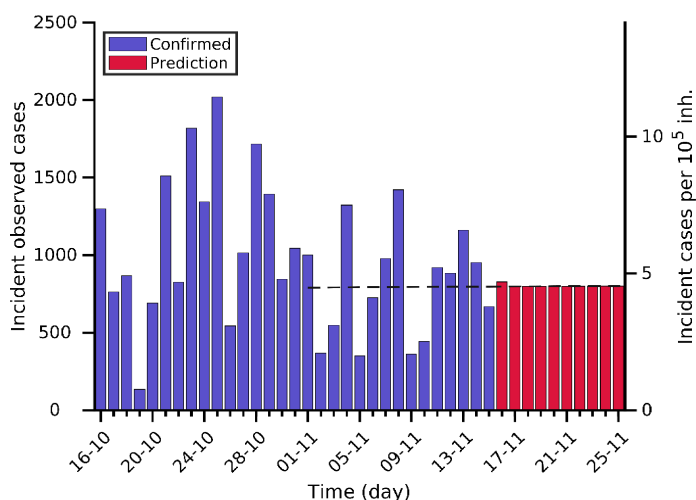


Predictions for next days

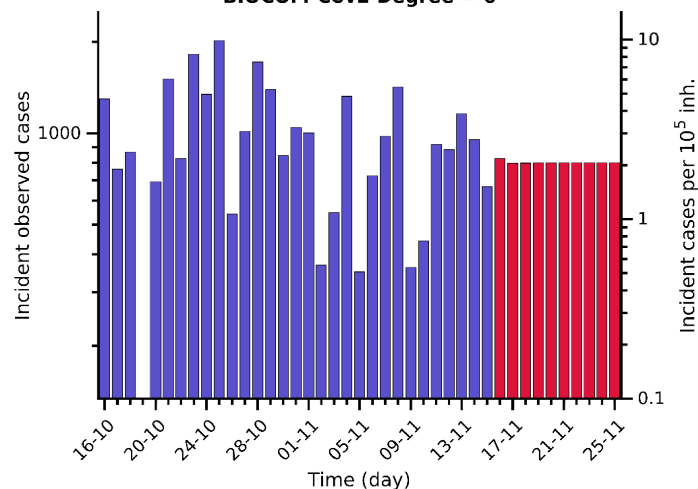
Day	Number of cases	95% Confidence Interval
18-11-2020	182719 (+2424)	[180578 - 184860]
22-11-2020	185918 (+5623)	[180877 - 190959]
25-11-2020	188320 (+8025)	[180295 - 197944]

Current indicators

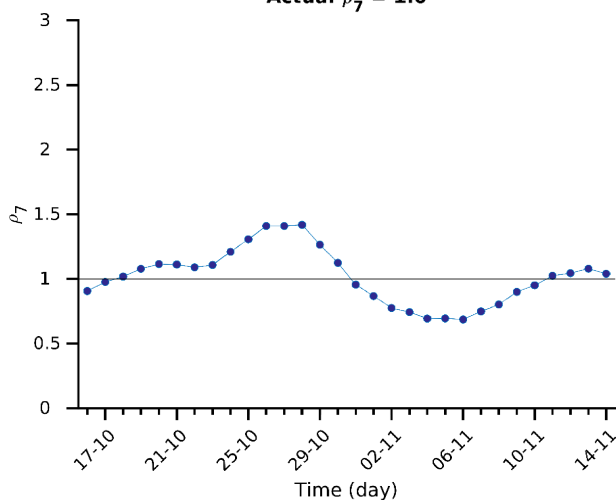
	A14	EPG	CFR	N7	D7
Today	63	65	2.22 %	770	25
A Week ago	75	56	2.26 %	816	21
Maximum	123	500	4.89 %	2326	595



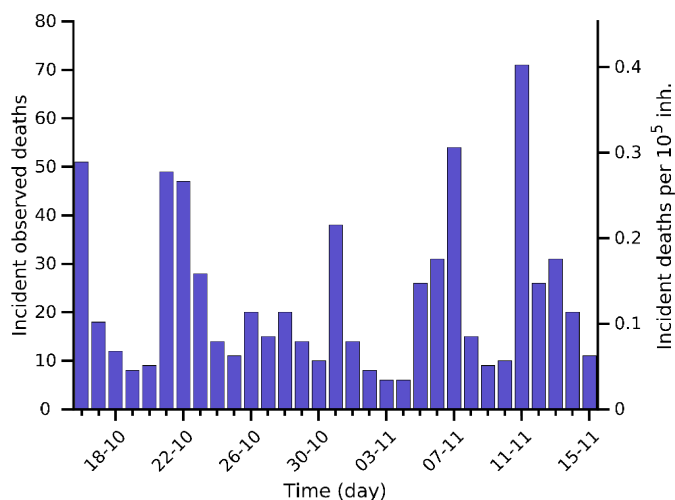
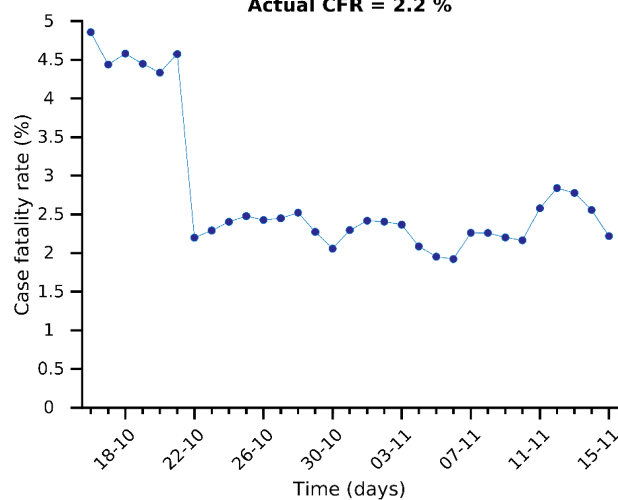
BIOCOM-Cov2 Degree = 6



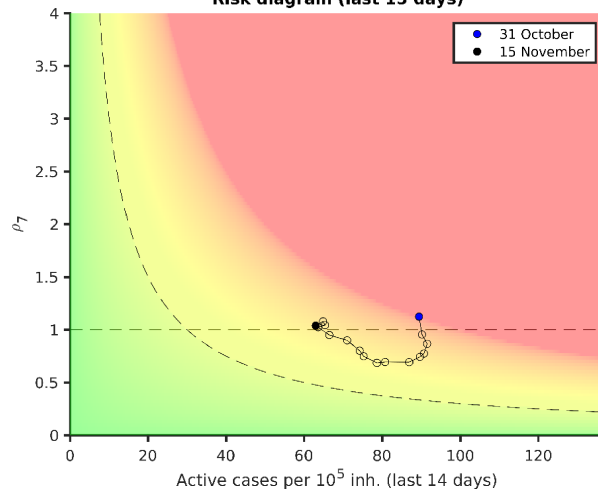
Actual $\rho_7 = 1.0$



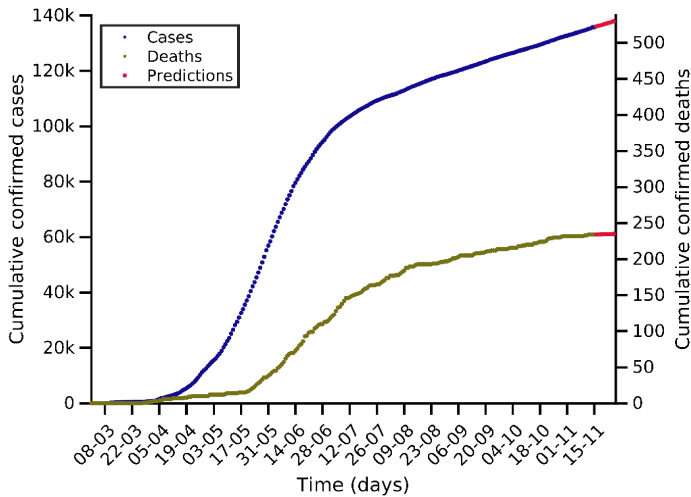
Actual CFR = 2.2 %



Risk diagram (last 15 days)

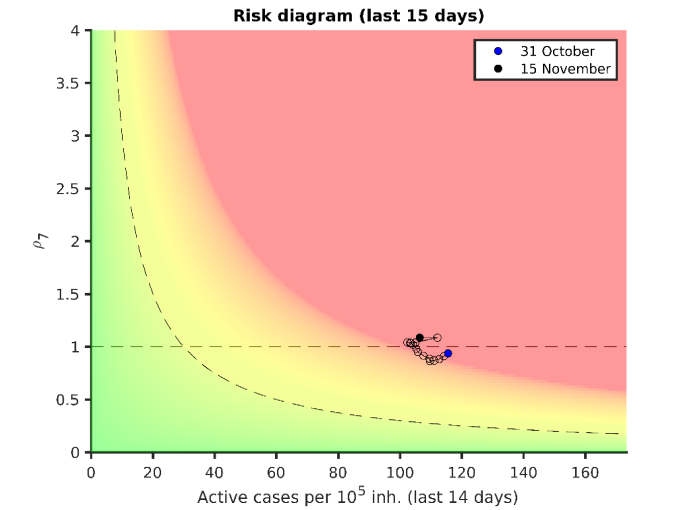
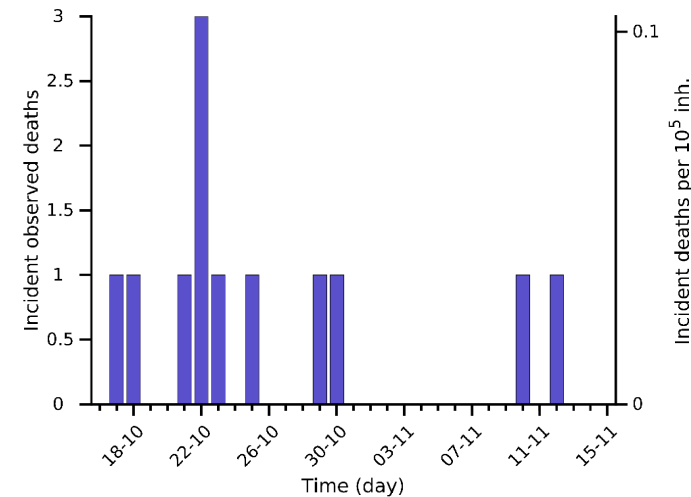
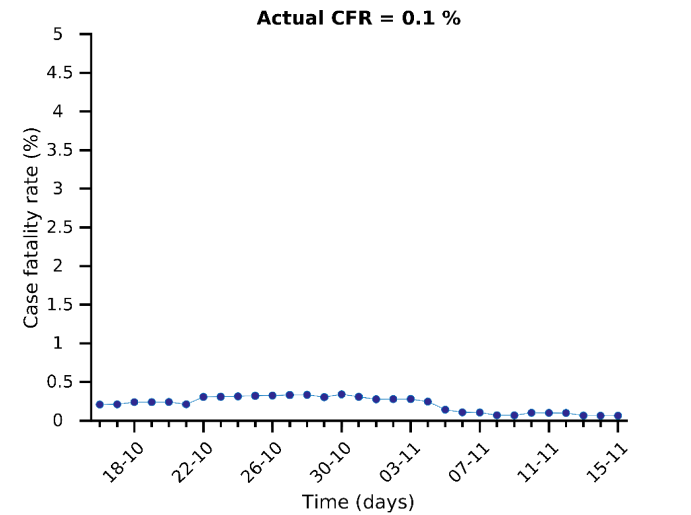
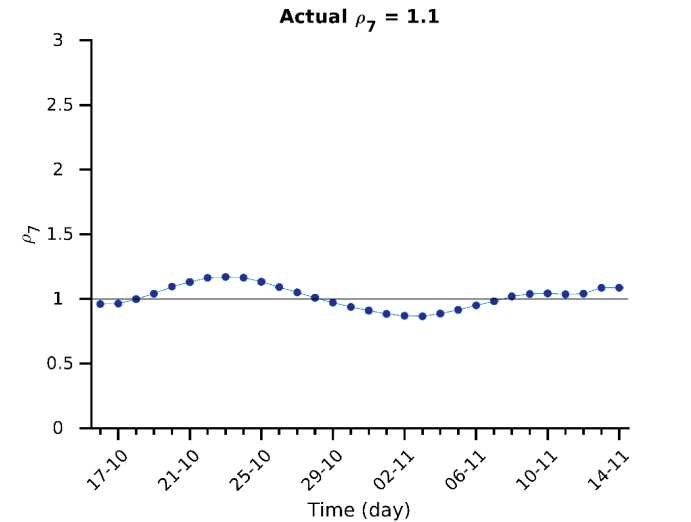
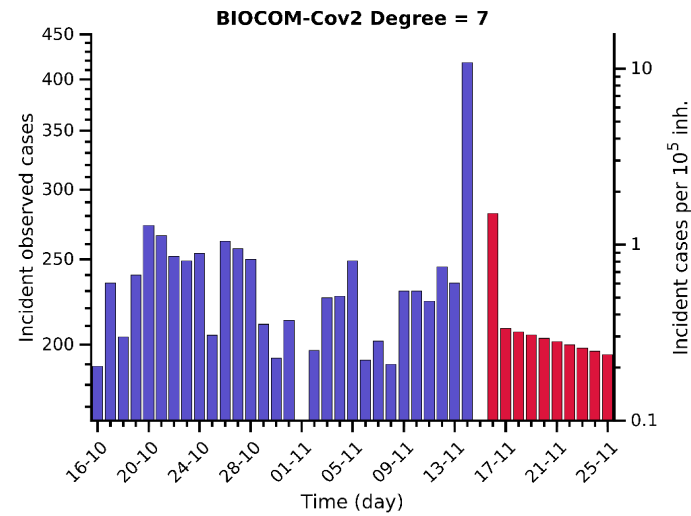
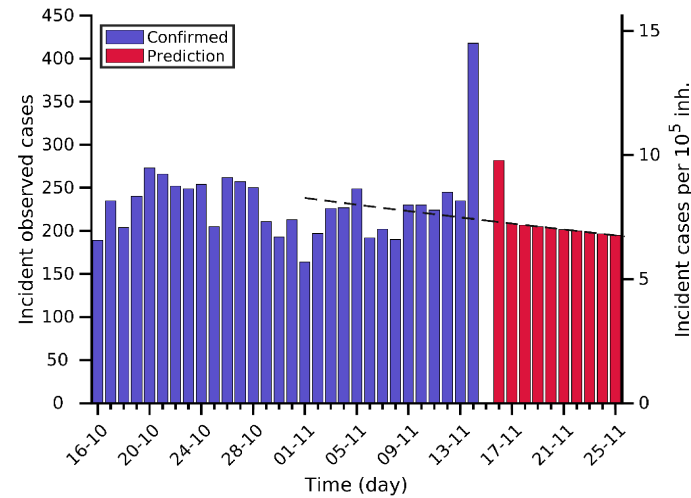


Qatar 15-11-2020. Pop: 2.9M. Cumulative incidence: 4713/10⁵

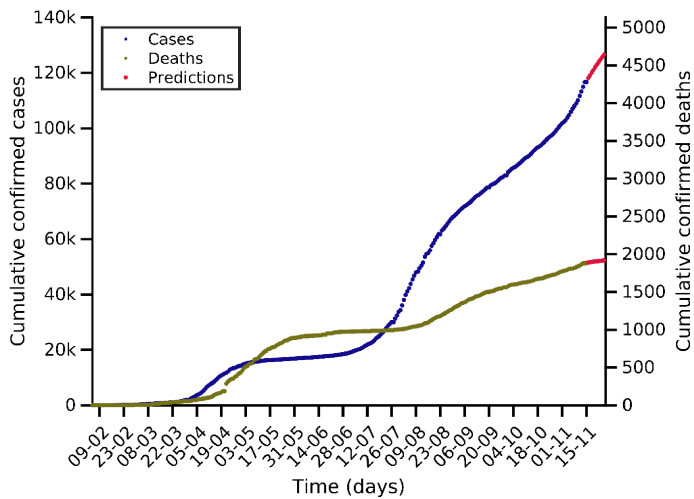


Predictions for next days		
Day	Number of cases	95% Confidence Interval
18-11-2020	136482 (+697)	[135785 - 138196]
22-11-2020	137292 (+1507)	[135785 - 139453]
25-11-2020	137882 (+2097)	[135785 - 140743]

Current indicators					
	A14	EPG	CFR	N7	D7
Today	106	116	0.06 %	226	0
A Week ago	105	103	0.07 %	212	0
Maximum	871	954	1.98 %	1888	4



Japan 15-11-2020. Pop: 126.5M. Cumulative incidence: 92/10⁵

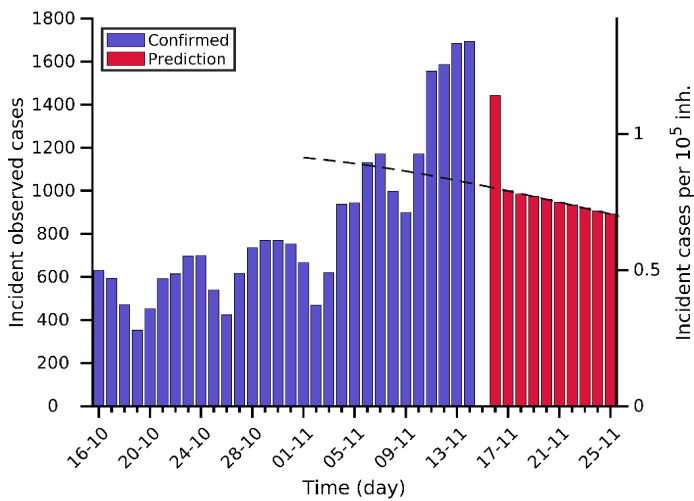


Predictions for next days

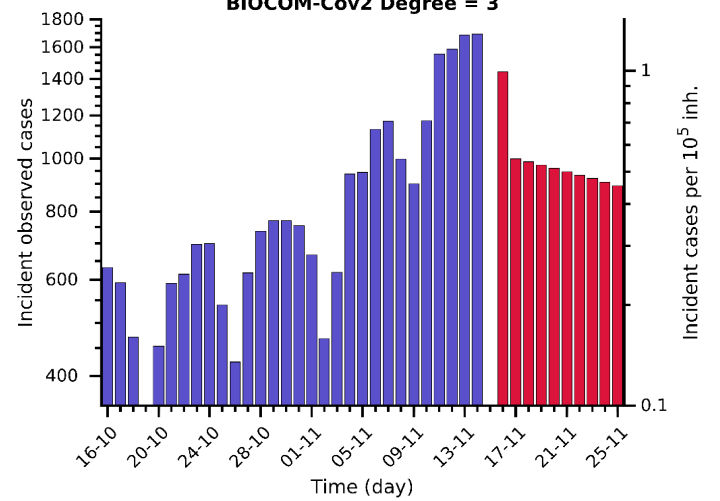
Day	Number of cases	95% Confidence Interval
18-11-2020	120106 (+3429)	[116677 - 128955]
22-11-2020	123920 (+7243)	[116677 - 141279]
25-11-2020	126638 (+9961)	[116677 - 157092]

Current indicators

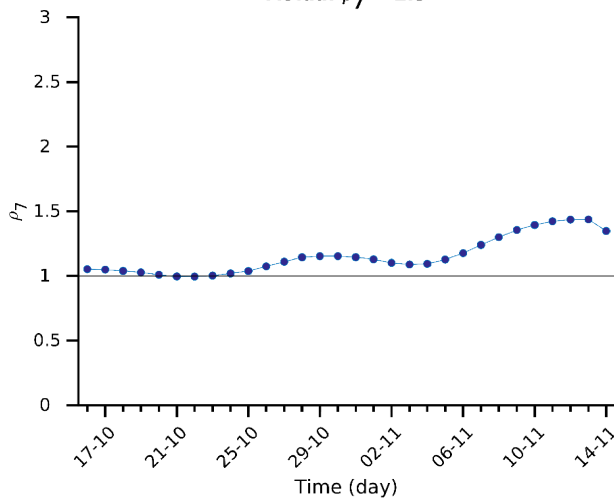
	A14	EPG	CFR	N7	D7
Today	12	16	1.41 %	1228	9
A Week ago	9	11	1.35 %	896	6
Maximum	15	21	4.97 %	1581	29



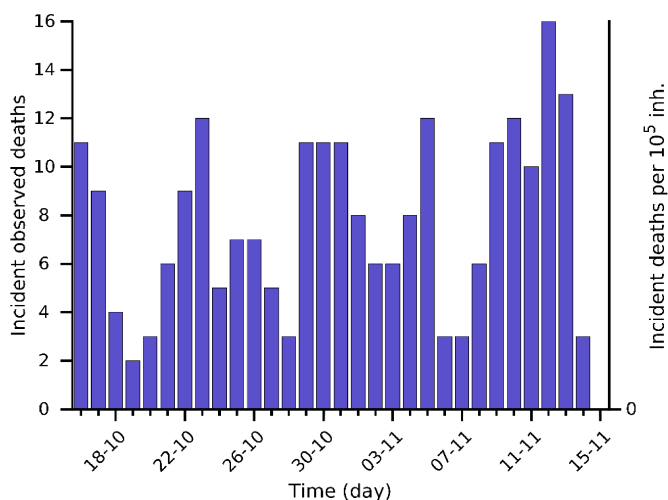
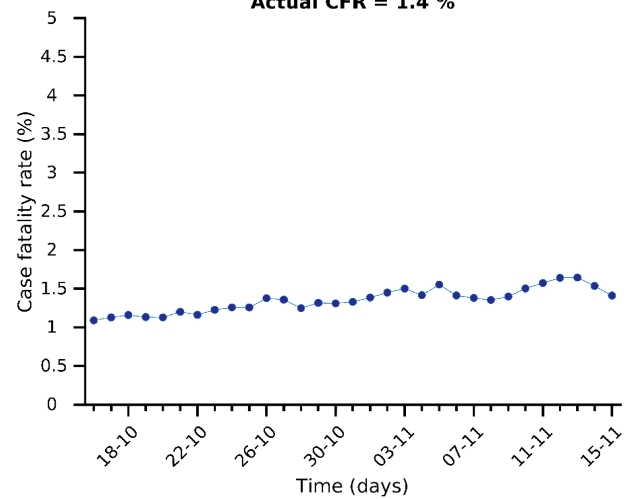
BIOCOM-Cov2 Degree = 3



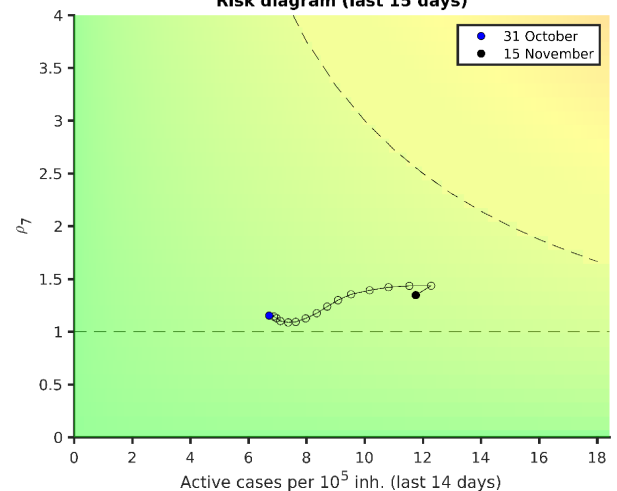
Actual $\rho_7 = 1.3$



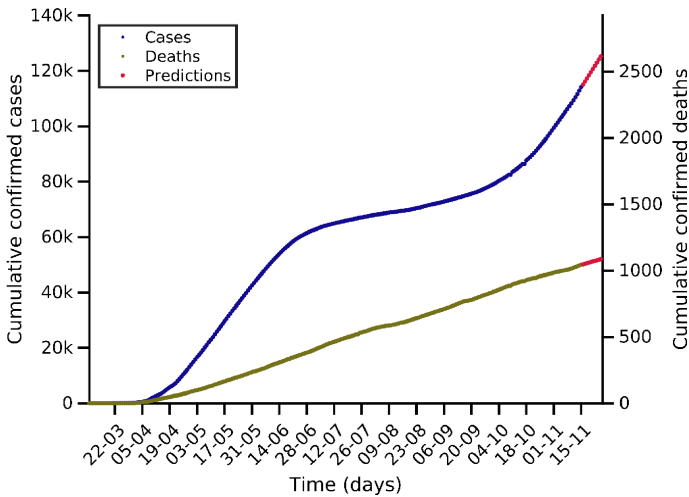
Actual CFR = 1.4 %



Risk diagram (last 15 days)

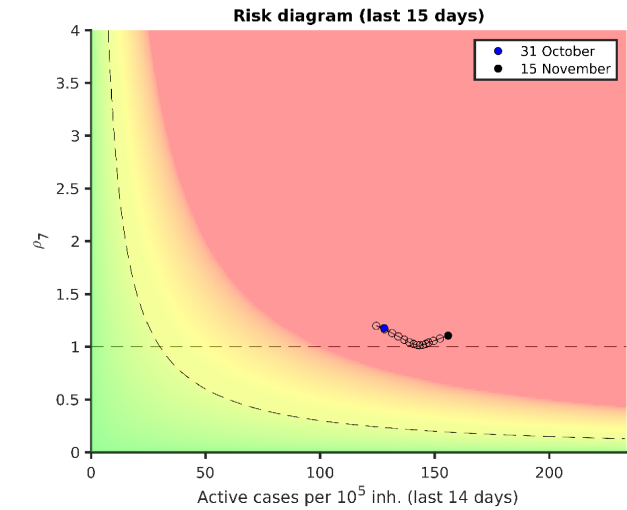
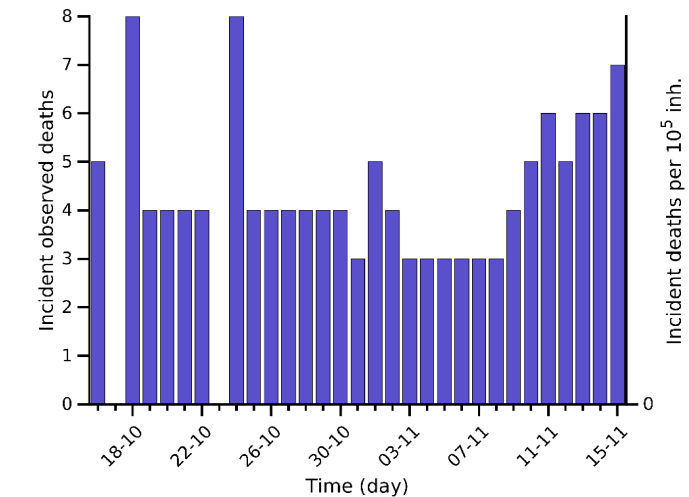
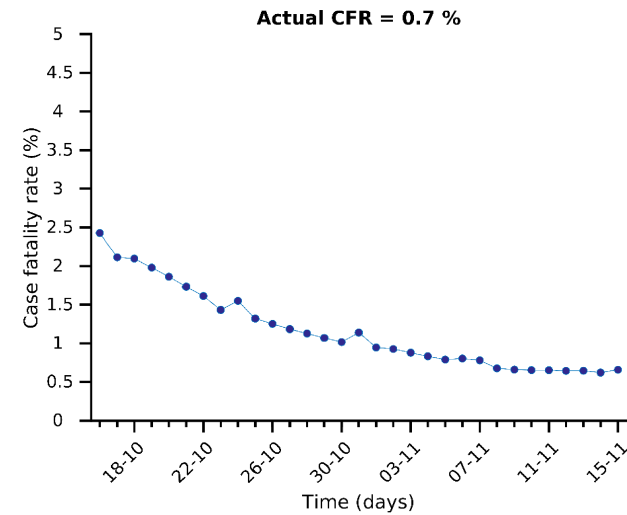
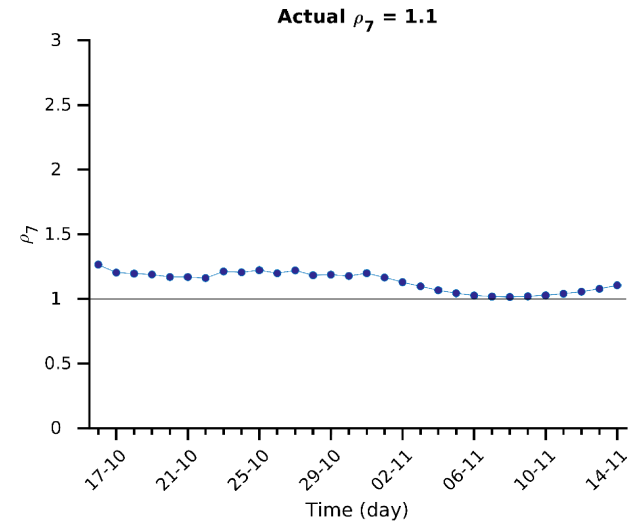
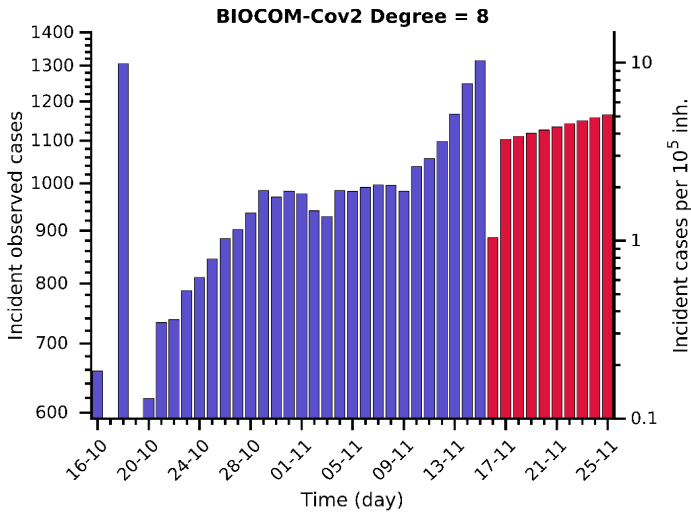
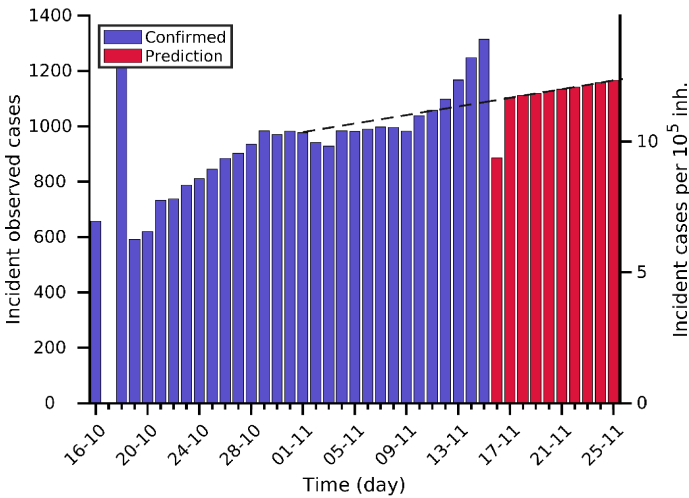


Belarus 15-11-2020. Pop: 9.4M. Cumulative incidence: 1208/10⁵

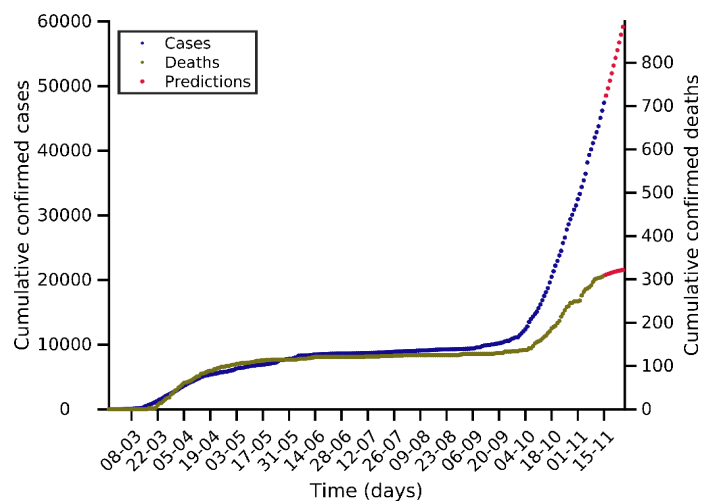


Predictions for next days		
Day	Number of cases	95% Confidence Interval
18-11-2020	117285 (+3100)	[114224 - 120346]
22-11-2020	121806 (+7621)	[114632 - 128980]
25-11-2020	125279 (+11094)	[114185 - 139263]

Current indicators					
	A14	EPG	CFR	N7	D7
Today	156	172	0.66 %	1129	6
A Week ago	142	145	0.68 %	974	3
Maximum	156	172	4.92 %	1129	6



Malaysia 15-11-2020. Pop: 32.4M. Cumulative incidence: 147/10⁵

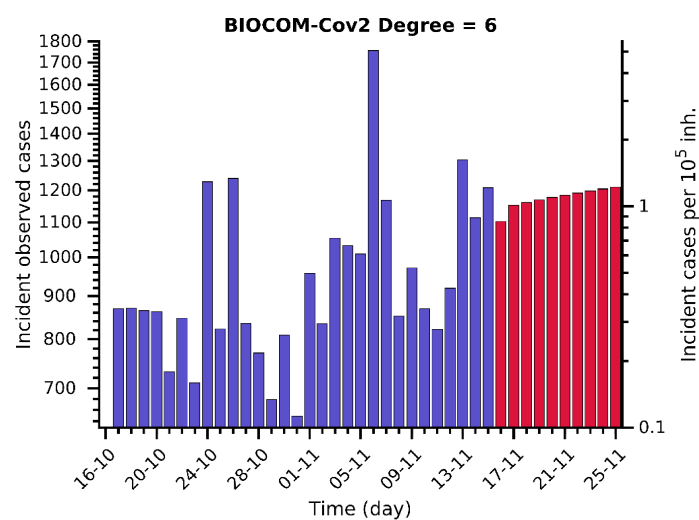
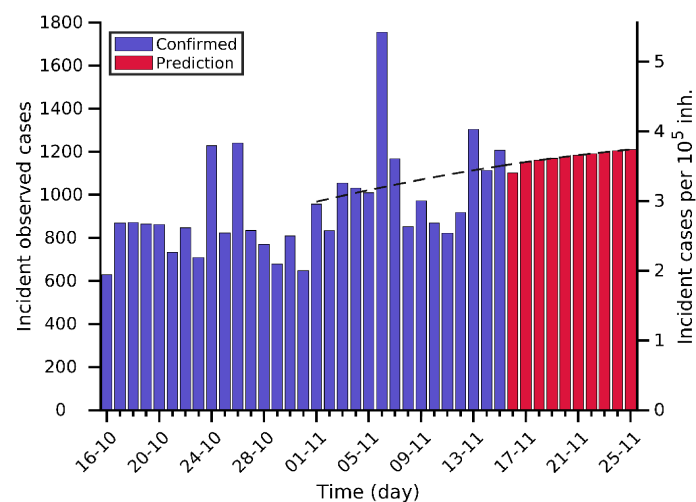


Predictions for next days

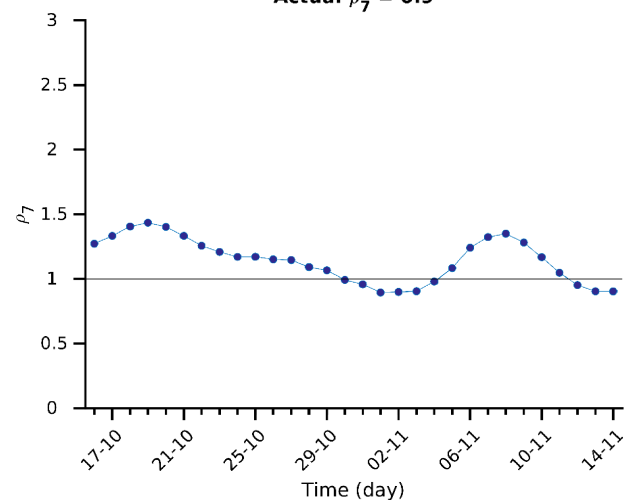
Day	Number of cases	95% Confidence Interval
18-11-2020	50832 (+3415)	[47417 - 66024]
22-11-2020	55554 (+8137)	[47417 - 67788]
25-11-2020	59168 (+11751)	[47417 - 82658]

Current indicators

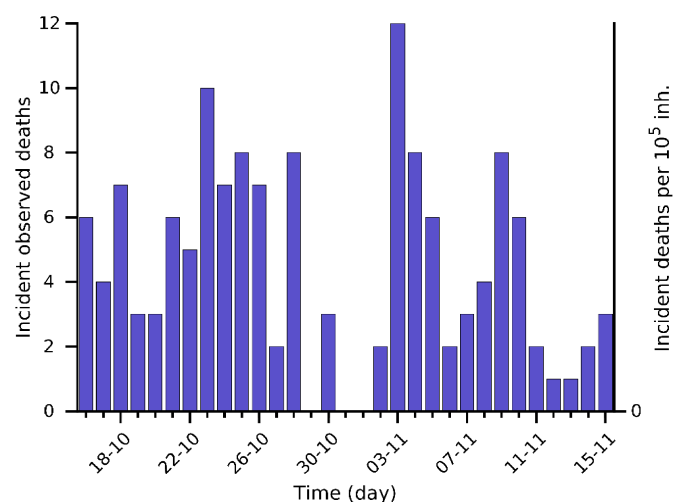
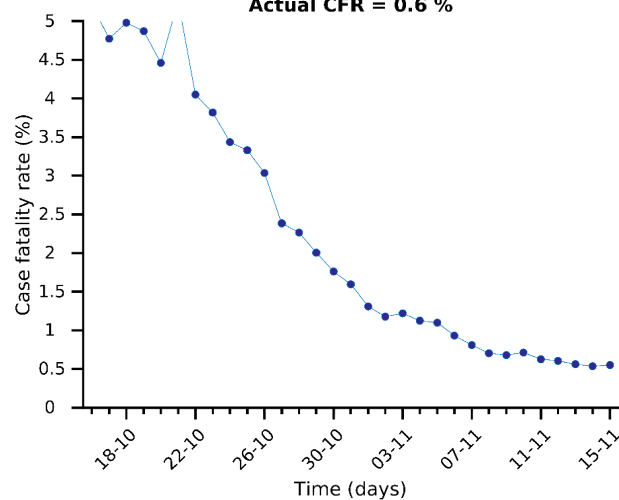
	A14	EPG	CFR	N7	D7
Today	46	42	0.55 %	1030	3
A Week ago	42	56	0.70 %	1101	5
Maximum	46	56	4.98 %	1120	7



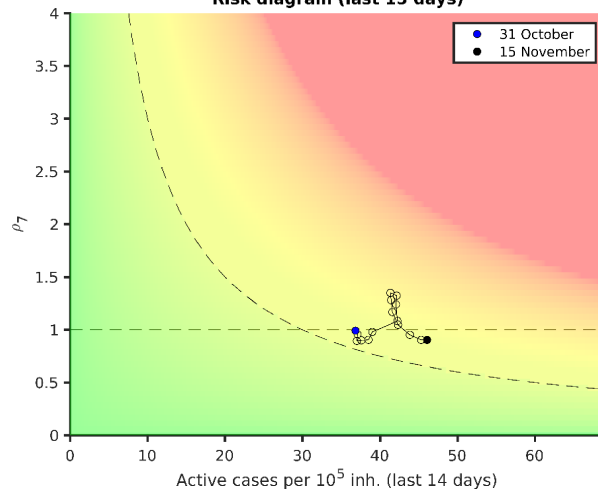
Actual $\rho_7 = 0.9$



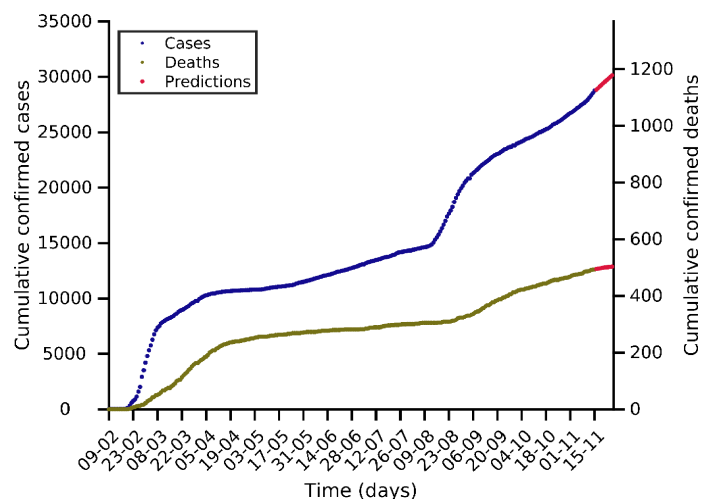
Actual CFR = 0.6 %



Risk diagram (last 15 days)



South Korea 15-11-2020. Pop: 51.3M. Cumulative incidence: 56/10⁵

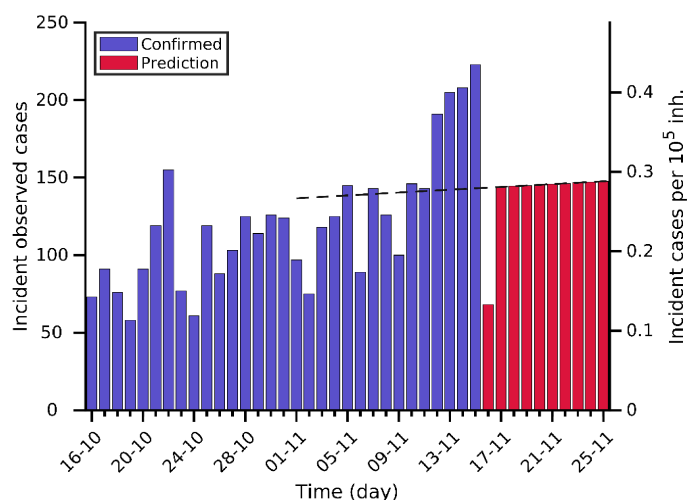


Predictions for next days

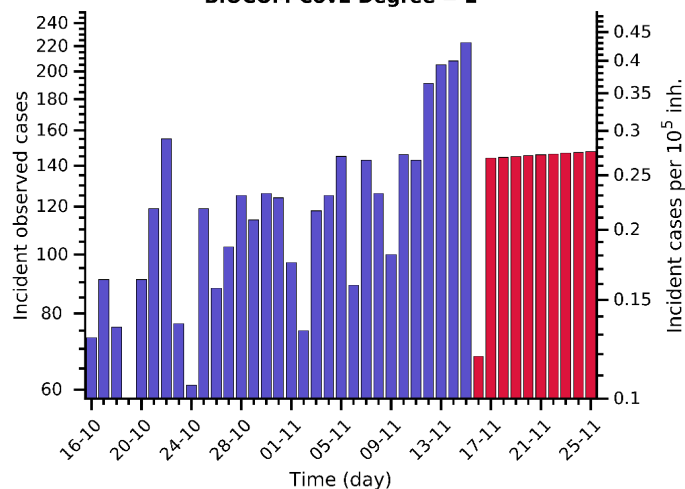
Day	Number of cases	95% Confidence Interval
18-11-2020	29126 (+357)	[28769 - 30291]
22-11-2020	29708 (+939)	[28769 - 32333]
25-11-2020	30150 (+1381)	[28769 - 35198]

Current indicators

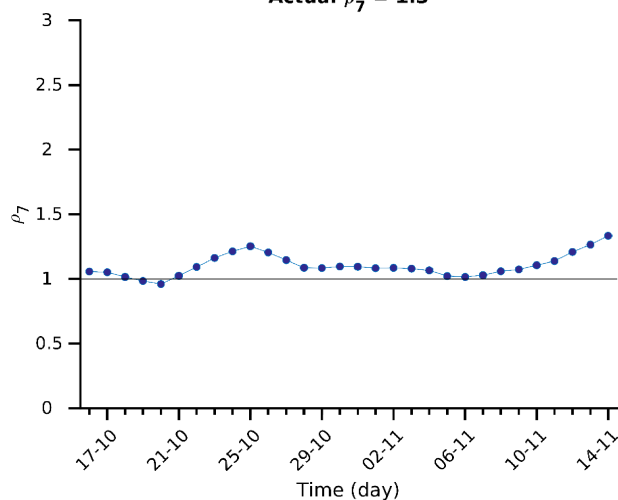
	A14	EPG	CFR	N7	D7
Today	4	5	2.08 %	174	2
A Week ago	3	3	2.07 %	117	2
Maximum	13	114	4.98 %	609	7



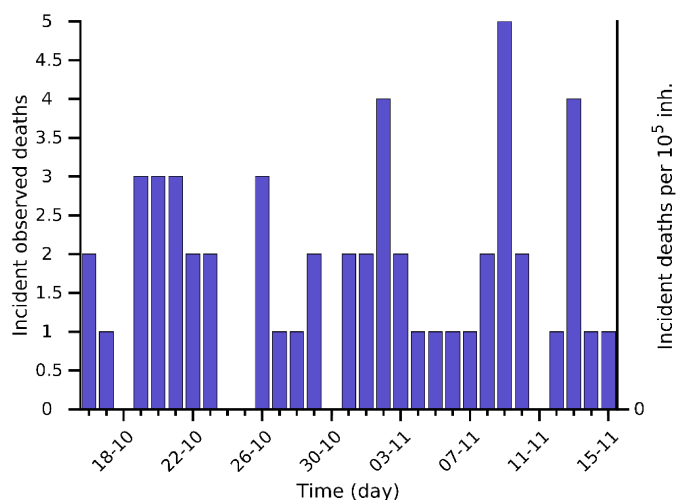
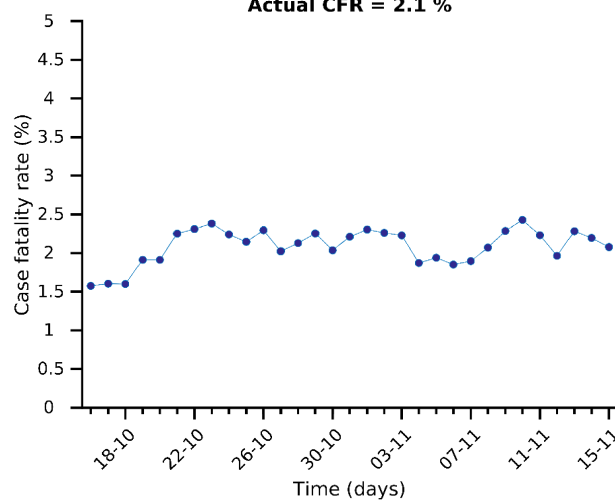
BIOCOM-Cov2 Degree = 2



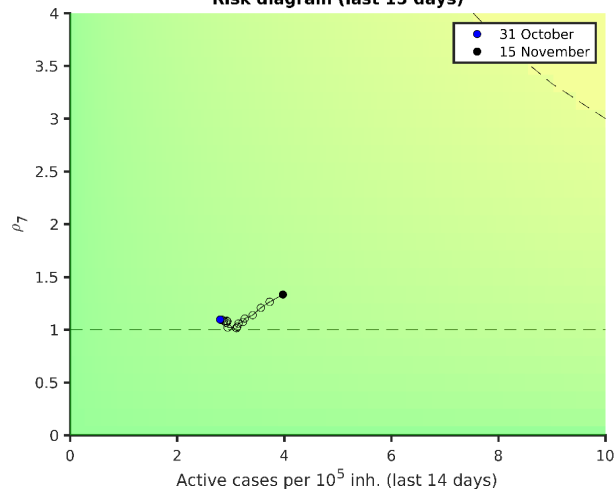
Actual $\rho_7 = 1.3$



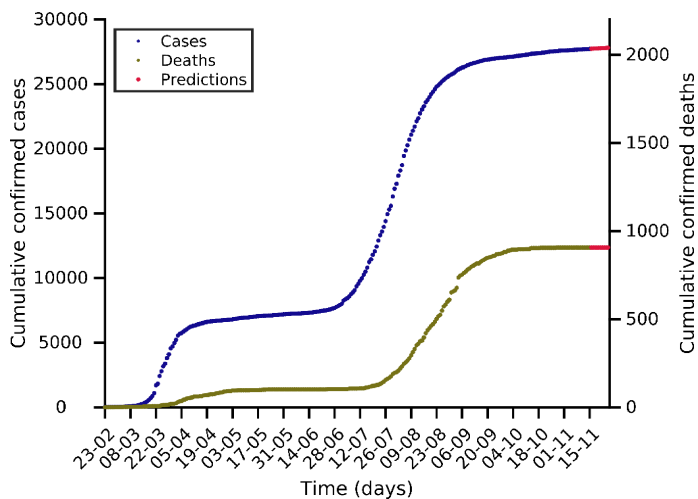
Actual CFR = 2.1 %



Risk diagram (last 15 days)



Australia 15-11-2020. Pop: 25.5M. Cumulative incidence: 109/10⁵

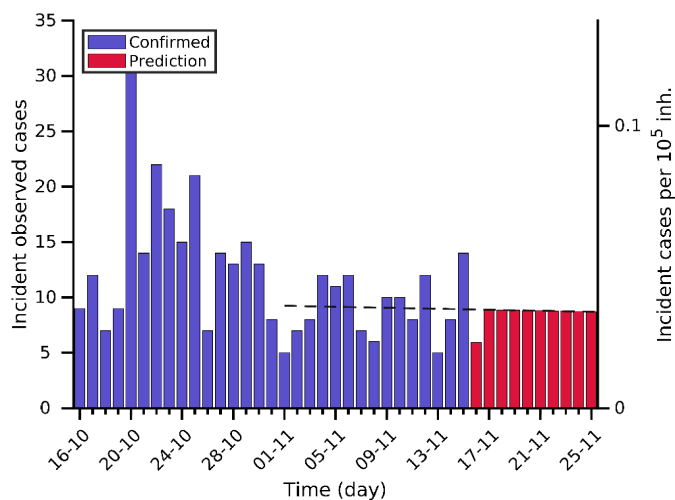


Predictions for next days

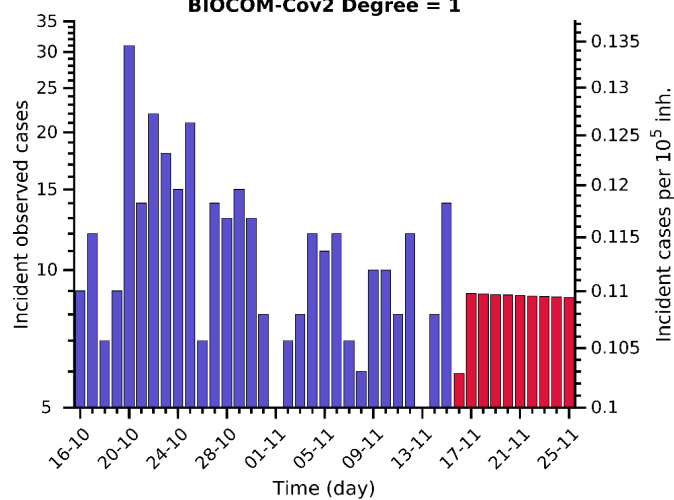
Day	Number of cases	95% Confidence Interval
18-11-2020	27749 (+24)	[27725 - 27785]
22-11-2020	27784 (+59)	[27740 - 27827]
25-11-2020	27810 (+85)	[27755 - 27865]

Current indicators

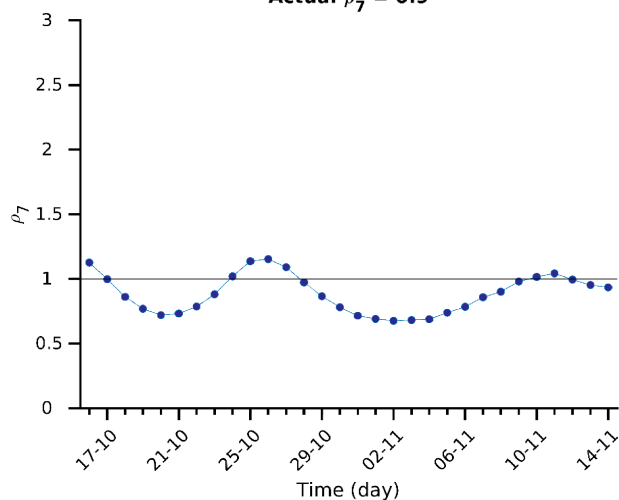
	A14	EPG	CFR	N7	D7
Today	1	0	0.00 %	10	0
A Week ago	1	0	0.79 %	9	0
Maximum	26	38	5.00 %	552	22



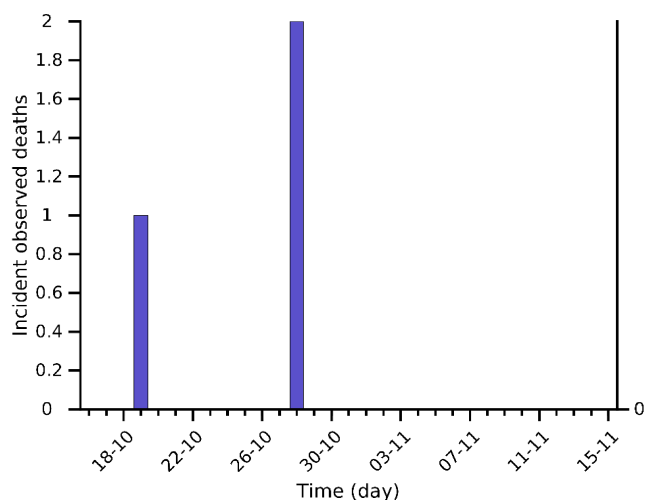
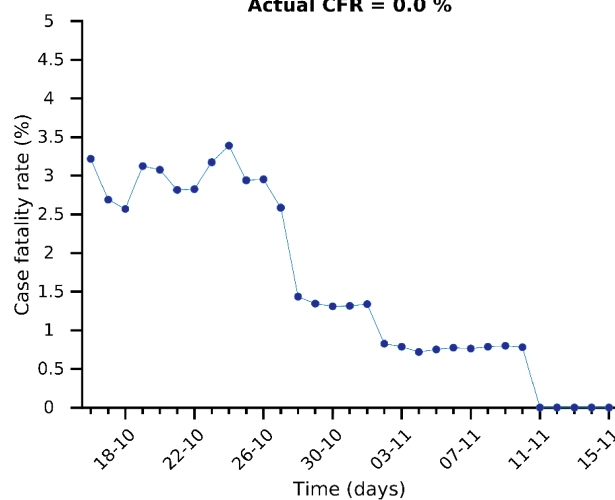
BIOCOM-Cov2 Degree = 1



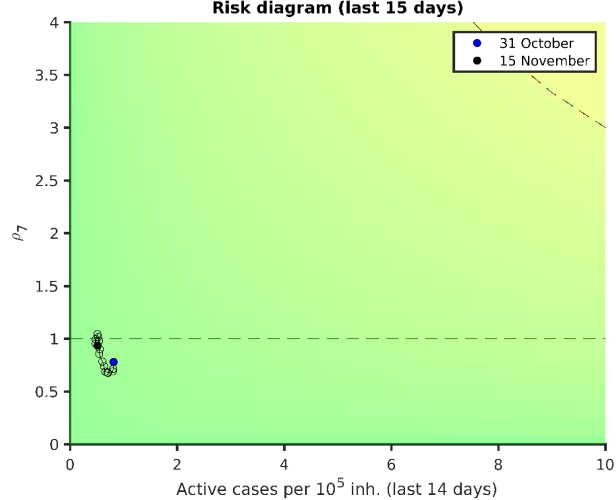
Actual $\rho_7 = 0.9$



Actual CFR = 0.0 %



Risk diagram (last 15 days)



Methods

Methods

(1) Data source

Data are daily obtained from European Centre for Disease Prevention and Control (ECDC)² and country official sources (when indicated). Daily data comprise, among others: total confirmed cases, total confirmed new cases, total deaths, total new deaths. It must be considered that the report is always providing data from previous day. In the document we use the date at which the datapoint is assumed to belong, i.e., report from 15/03/2020 is giving data from 14/03/2020, the latter being used in the subsequent analysis.

(2) Data processing and plotting

Data are initially processed with Matlab in order to update timeseries, i.e., last datapoints are added to historical sequences. These timeseries are plotted for individual countries and for the UE+EFTA+UK as a whole:

- ✓ Number of cumulative confirmed cases
- ✓ Number of reported new cases
- ✓ Number of cumulative deaths

Then, two indicators are calculated and plotted, too:

- ✓ Case fatality rate: number of cumulative deaths divided by the number of cumulative confirmed cases, and reported as a percentage; it is an indirect indicator of the diagnostic level.
- ✓ ρ : this variable is related with the reproduction number, i.e., with the number of new infections caused by a single case. It is evaluated as follows for the day before last report ($t-1$):

$$\rho(t-1) = \frac{N_{new}(t) + N_{new}(t-1) + N_{new}(t-2)}{N_{new}(t-5) + N_{new}(t-6) + N_{new}(t-7)}$$

where $N_{new}(t)$ is the number of new confirmed cases at day t after applying a 7-day moving average to the new cases dataset, so that fluctuations (e.g., weekend effect) are smoothed.

(3) Classification of countries according to their epidemic level: the scale Biocom-Cov

Countries are assigned a degree in the discrete Biocom-Cov scale, which aims to facilitate a simple way of assessing the situation of the country. It is based on the level of daily new cases per 100,000 inhabitants as follows:

Pandemic degree	Daily new incident cases per 10 ⁵ inh.
0	0
1	0-0.1
2	0.1-0.5
3	0.5-1.25
4	1.25-2
5	2-3
6	3-5
7	5-8
8	8-14
9	>14

² <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases>

(4) Fitting a mathematical model to data

Previous studies have shown that Gompertz model³ correctly describes the Covid-19 epidemic in all analysed countries. It is an empirical model that starts with an exponential growth but that gradually decreases its specific growth rate. Therefore, it is adequate for describing an epidemic wave that is characterized by an initial exponential growth but a progressive decrease in spreading velocity provided that appropriate control measures are applied. Once in the tail, predictions work but the meaning of parameters is lost.

Gompertz model is described by the equation:

$$N(t) = K e^{-\ln\left(\frac{K}{N_0}\right) \cdot e^{-a \cdot (t-t_0)}}$$

where $N(t)$ is the cumulated number of confirmed cases at t (in days), and N_0 is the number of cumulated cases the day at day t_0 . The model has two parameters:

- ✓ a is the velocity at which specific spreading rate is slowing down;
- ✓ K is the expected final number of cumulated cases at the end of the epidemic.

This model is fitted to reported cumulative cases of the UE and of countries that accomplish two criteria: 4 or more consecutive days with more than 100 cumulated cases, and at least one datapoint over 200 cases. Day t_0 is chosen as that one at which $N(t)$ overpasses 100 cases. If more than 15 datapoints that accomplish the stated criteria are available, only the last 15 points are used. The fitting is done using Matlab's Curve Fitting package with Nonlinear Least Squares method, which also provides confidence intervals of fitted parameters (a and K) and the R^2 of the fitting. At the initial stages the dynamics is exponential and K cannot be correctly evaluated. In fact, at this stage the most relevant parameter is a .

It is worth to mention that the simplicity of this model and the lack of previous assumptions about the Covid-19 behaviour make it appropriate for universal use, i.e., it can be fitted to any country independently of its socioeconomic context and control strategy. Then, the model is capable of quantifying the observed dynamics in an objective and standard manner and predicting short-term tendencies.

(5) Using the model for predicting short-term tendencies

The model is finally used for a short-term prediction of the evolution of the cumulated number of cases (3-5 days). The confidence interval of predictions is assessed with the Matlab function `predint`, with a 99% confidence level. These predictions are shown in the plots as red dots with corresponding error bar. For series longer than 9 timepoints, last 3 points are weighted in the fitting so that changes in tendencies are well captured by the model.

(6) Estimating non-diagnosed cases

Lethality of Covid-19 has been estimated at around 1 % for Republic of Korea and the Diamond Princess cruise. Besides, median duration of viral shedding after Covid-19 onset has been estimated at 18.5 days for non-survivors⁴ in a retrospective study in Wuhan. These data allow for an estimation of total number of cases, considering that the number of deaths at certain moment should be about 1 % of total cases 18.5 days before. This is valid for estimating cases of countries at stage II, since in stage I the deaths would be mostly

³ Madden LV. Quantification of disease progression. *Protection Ecology* 1980; **2**: 159-176.

⁴ Zhou et al., 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*; March 9, doi: 10.1016/S0140-6736(20)30566-3

due to the incidence at the country from which they were imported. We establish a threshold of 50 reported cases before starting this estimation.

Reported deaths are passed through a moving average filter of 5 points in order to smooth tendencies. Then, the corresponding number of cases is found assuming the 1 % lethality. Finally, these cases are distributed between 18 and 19 days before each one.